ELECTRICAL SOUTH

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Serving the 18 Sout[illegible]tes

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JULY 1958

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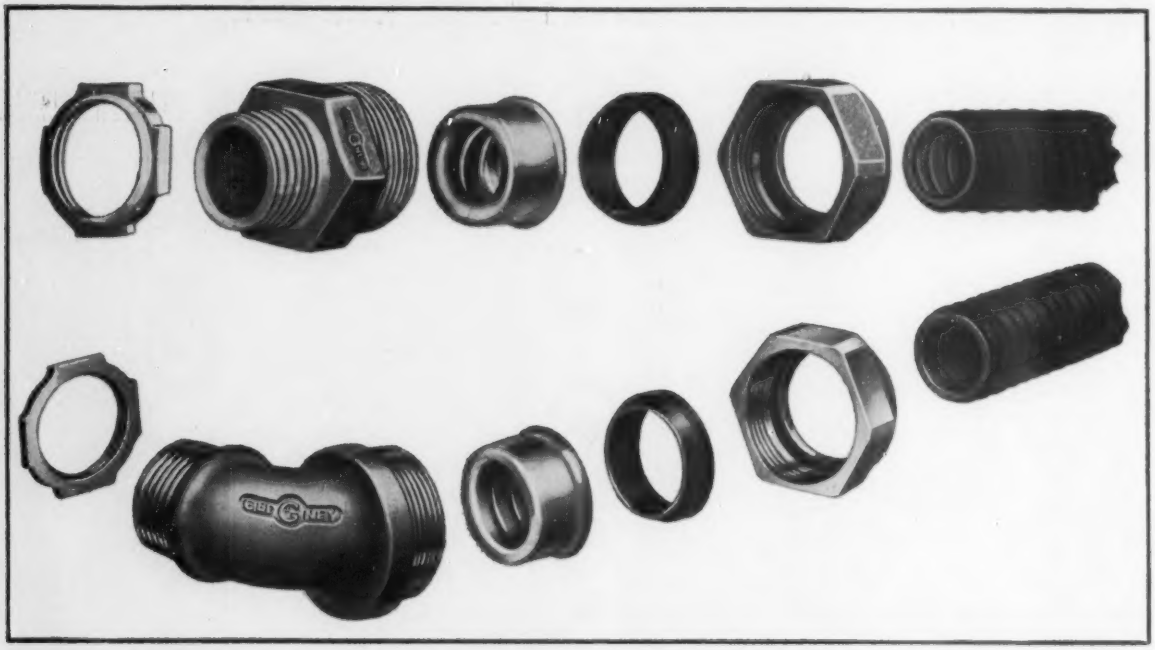

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Volume 38 **Number 7**

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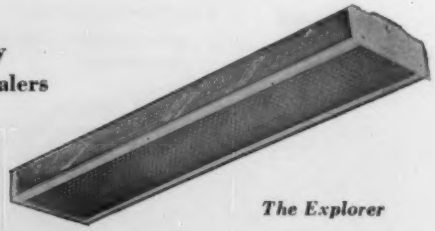

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SERVING THE 18 SOUTHERN AND SOUTHWESTERN STATES

July, 1958 — Vol. 38—No. 7

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Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

◆ AS ONE LISTENS to the pro and con of America's economic situation, one can become extremely confused about the nation's economic health. On many occasions, this column has indicated that economic health is often related to the psychological reaction of people to the affairs of the day. In line with this factor, the material presented in this issue should aid in building confidence in the economic scene.

Remarkable savings surge

Since the end of World War II there has been a most remarkable surge in personal savings until, at the present time, American citizens have a tremendous purchasing power potential in readiness for future expenditures. There is not a single saving mechanism that has not received a share of this growing stockpile of cash savings. Yet, at the same time, the standard of living of the people has risen along with an expansion of quantity and variety of consumer purchases.

Thus the last twelve years has been a most unusual period of economic progress. Can there be anything but long-run confidence in an economic system that has allowed such a situation to develop?

One generally thinks of a savings bank deposit when the term "savings" is used. Although this is one of the more important channels for thrift, it is not the only one and all others are sharing in the public's desire for savings. The commercial banks of the nation now hold approximately sixty billion dollars worth of time deposits, and during the past twelve years, this figure has doubled.

If an investigation were to go back beyond the recent war years, there would be an even more phenomenal rate of growth. This does not include, of course, the large sums held in demand accounts that in part may be savings although not productive of interest returns.

Mutual savings banks show deposits of over thirty-two billion dollars and these institutions have shown an even greater rate of growth than the commercial banks. Savings accounts in mutual savings banks have more than tripled since World War II.

The savings and loan societies that were not particularly important in pre World War II years have also mushroomed recently. In many cases, their higher rate of interest, plus federal insurance of deposits has made them a good place to invest savings funds. This type of institution now holds approximately forty-three billions of dollars of personal savings.

Government stimulated savings

The federal government is also a stimulator of savings and its importance in this field is growing quite rapidly. The main problem here is in the area of savings bonds. Such securities are purchased with greater frequency during periods of patriotic fervor and when other investments are either more precarious or pay lower interest rates. The present year has neither of these aspects, and as a result, there is not the growth impetus that was present in the war years. The public has invested approximately fifty-two billion in savings bonds, over one and a quarter billion in postal savings, and over three billion in governmental credit unions.

One of the big sources of investment monies is the life insurance industry. Although the average layman does not think of such companies as savings institutions, they rightfully belong in that category. The reserves held by life insurance companies to pay claims upon them are in truth the combined savings of the many policy holders associated under the companies' administration. Such reserves amount to approximately eighty-five billion and represent an increase of almost three times over the level of pre-war years.

If one totals the entire amount of savings listed in the above normal institutions of savings, the figure achieved is approximately two hundred and seventy-six billion dollars. The fact that this figure represents one of the greatest indications of financial security for American citizens cannot be challenged. Savings alone represent well over half of the nation's annual output of goods and services, often termed the "gross national product." When such a sum of savings becomes unlocked and flows into the market place, a tremendous spurt in sales can and will take place.

What about securities?

Nothing has been said about normal investments, such as stocks and bonds, that indicate also a definite amount of savings of the American people. Since investments are made for a variety of purposes, of which savings is only one, and by a great variety of persons and institutions, it is not proper to consider the sum total of investment values as savings.

Moreover, since securities are bought and sold on the market place and their price varies accordingly, there is apt to be a changing figure of values recorded on a day-to-day basis. It is safe to say, however, that the total dollar value of investment securities is slightly in excess of the value of savings in other forms. This means that on the same comparative basis, (that is, in relation to the estimated gross national product for 1958), the American people control a total of savings and investment that exceeds the GNP by 33.8 per cent.

Although a review of this nature that portrays the stability and inherent strength of the American economic system is no indication that a recession or depression could not exist here, it does serve to re-emphasize the fact that the nation and its people have resources unmatched around the world. It is comforting to know this and it should be instrumental in building confidence.

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

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"Natural Electric Conduits" is the title of the 30-page Catalog No. 603 which describes and illustrates the many types of electrical conduits that are manufactured by National Electric Products Corp., 2 Gateway Center, Pittsburgh 22, Pa.

1015—Squeezon Connectors

The Squeezon, a new compression connector for power lines, is fully described in bulletin "SQ" available from the James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo. The Squeezon features greatly increased electrical and mechanical efficiency.

1019—Service Panels

Information on protective electrical control centers for homes, apartment buildings, service stations, and industrial applications is contained in Bulletin PM-385, "BullDog Pushmatic Electric-Centers," issued by BullDog Electric Products Co., 7610 Jos Campau, Detroit, Mich.

1085—Lighting Fixtures

Eastern presents their most complete catalog, 32 pages of engineered lighting data, including a variety of fixtures for all architectural, commercial and industrial applications. Eastern Fixture Co., Inc., 170 Vernon St., Boston 20, Mass.

1097—Cord Catalog

A complete 48-page catalog is available from the Cornish Wire Co., 50 Church St., New York 7, N. Y. containing all data on flexible and portable cords, lamp cords, heater cords, cordsets, radio and electronic wires.

1103—Connectors

Comprehensive, up-to-date information on electrical connections for overhead lines in transmission and distribution is now available in one convenient publication, a 100-page manual issued by Burndy Corp., Norwalk, Conn., on connection techniques, connectors, and installation tooling.

1109—Anchoring Devices

An illustrated 32-page catalog, No. 65, describing more than 25 anchoring and drilling devices for making fastenings to masonry, is available from the Arro Expansion Bolt Co., Marion, Ohio.

1135—Wiring Devices

Catalog No. 56, and New Product Bulletins, containing the complete electrical wiring device line of Leviton Mfg. Co., Inc. Brooklyn 22, N. Y. Over 100-pages accurately illustrated and containing electrical and circuit wiring diagrams. Complete cross index for easy reference. Featured are Specification Grade Devices, Interchangeable line, Lev-O-Lock line, and many, many others; devices for every possible need and use in Industrial, Commercial and Residential applications.

1167—Industrial Lighting

A four-page catalog insert is now available from the Multi Electric Mfg. Co., Inc., 4223-43 West Lake St., Chicago 24, Ill. The leaflet describes Multi's line of lighting equipment and wiring devices, which include floodlights, vaporproof fixtures, and fluorescent and incandescent fixtures.

1197—Convenience Outlets

Bulletin gives complete information on the new P&S No. 500 for adding extra outlets to existing installations. Everything you need in a single package—no steel boxes required. Available from Pass & Seymour, Inc., Dept. ES, Syracuse 9, N. Y.

1199—Bending Equipment

A concise eight-page brochure has been made available from Tal Bending Equipment, Inc., 417 N. Water St., Milwaukee 2, Wis., describing their "One Shot" bender line. The Tal bender uses the same frame for standard pipe, copper tubing, radiant heat coils, rigid and thinwall conduit, bus bar, flat, round or square stock—from ⅜ to eight inches.

ELECTRICAL SOUTH
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July, 1958

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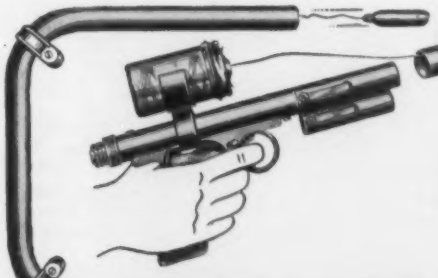

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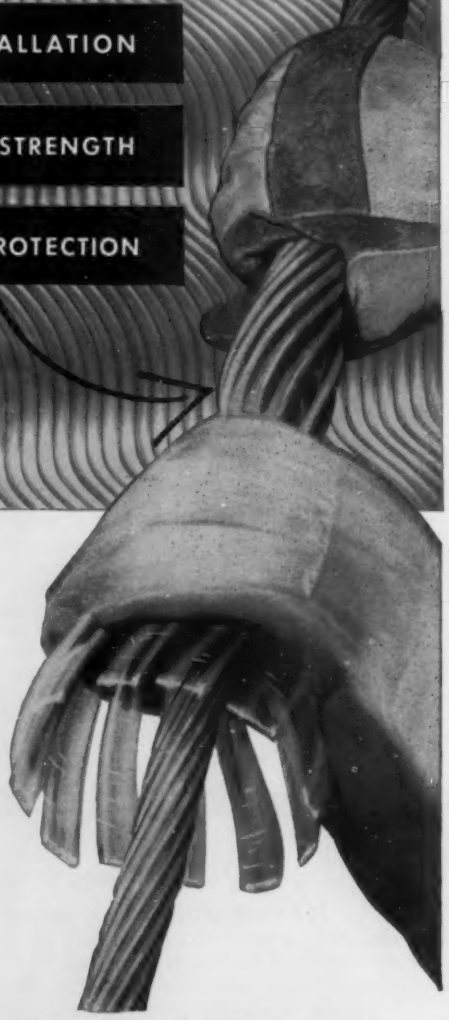

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1209—Fluorescent Ballasts

Advance Transformer Co., 2950 N. Western Ave., Chicago 18, Ill., has recently completed the compilation and printing of a 20-page catalog on fluorescent ballasts and their use. Included are data sheets on available Advance ballasts and a comprehensive installation and operation section and testing procedures. Copies of the booklet are available on request.

1211—Fluorescent Fixtures

Catalog folder No. 911, "Peerlite by Guth," has been announced by the Edwin F. Guth Co., 2615 Washington Blvd., St. Louis 3, Mo. Copies of this new eight-page booklet are available from the company upon request. The booklet is designed for the lighting specialist, giving complete engineering data and dimensions.

1219—Electrical Enclosures

Catalog No. 5354-U is a compact 94-page catalog describing the complete line of steel and aluminum electrical enclosures manufactured for utility use by the B & C Metal Stamping Co., 590 Means St., N. W., Atlanta, Ga. The catalog is well illustrated and contains complete specifications as well as prices on all items in the B & C line.

1223—Circuit Protection

A 24-page illustrated handbook contains suggestions for selecting the right kind of protection for electric circuits, motors, appliances and apparatus. Includes motor wiring diagrams and a complete list showing proper size fuses to use. Available from Bussman Mfg. Co., University at Jefferson, St. Louis 7, Mo.

1227—Conduit Fittings

A new complete 24-page catalog illustrating their complete line of conduit fittings and lighting parts for the electrical wholesaler has been made available by Elliott Electric Products Co., 1513 Olmstead Ave., New York 62, N. Y.

1229—Switch and Outlet Boxes

A new RACO General Catalog is now available listing detailed information on boxes, covers, and bar hangers. The catalog includes data on numbers of wires permitted per box and a list of comparative catalog numbers. Copy available from All-Steel Equipment, Inc., Aurora, Ill.

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Quickest, Most Economical Way to Detect

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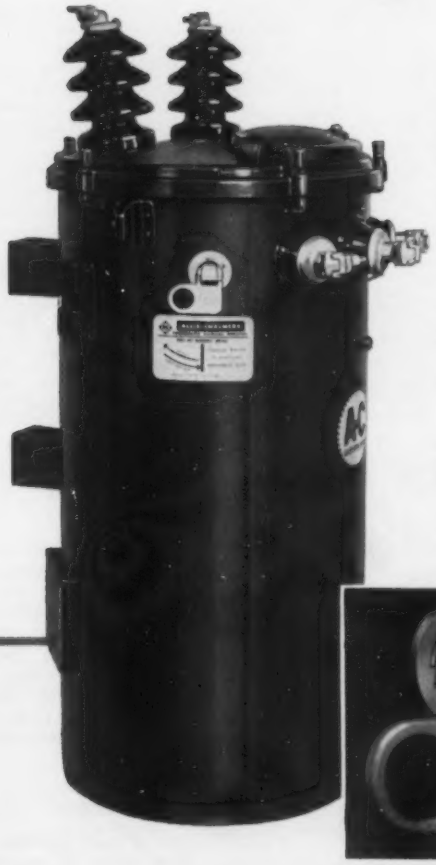

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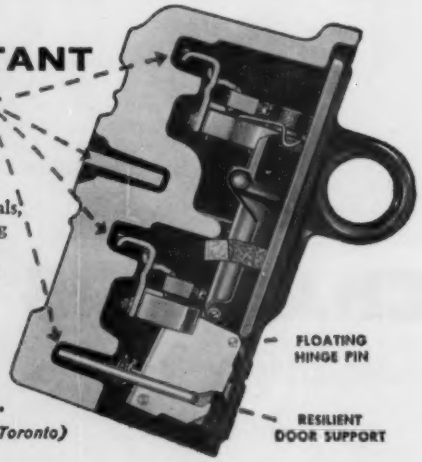
SHOCK RESISTANT EPOXY RESIN MOUNTING

The use of epoxy resin mountings gives strength and resiliency to contacts, terminals, trunnion, and mounting hanger. A floating hinge pin and mounting of the door assembly on a resilient trunnion gives full protection against door breakage. Ribbed housing provides high dielectric strength.



A. B. CHANCE CO.
General Offices: Centralia, Mo.
(A. B. Chance Company of Canada, Ltd., Toronto)
CK58-7

Enter Code Numbers of Catalogs Desired on Coupon on Page 6

1233—Troffer Catalog

A 36-page catalog, with complete information on their newly re-designed architectural troffers has been released by Smithcraft Lighting Division, Chelsea, Mass. Divided into sections for selection of lighting units, the catalog gives complete illustrations and data for 1 and 2 foot troffers in all types of ceiling construction. Also included in the catalog is information on ceiling lighting patterns, shielding designs, lighting techniques and applications.

1237—Wireholders

Knox Porcelain Corporation, Knoxville 1, Tenn. has recently redesigned a one-piece metal base style reinforced wireholder, No. 5009. Base and screw are hot dipped galvanized. This wireholder has extra sharp threads and quick starting point to make driving easy. KNOX manufacturers a complete line of Porcelain Wireholders, House Brackets, Service Entrance Mast Kits and Accessories and other Secondary Service Materials.

1253—Power Connectors

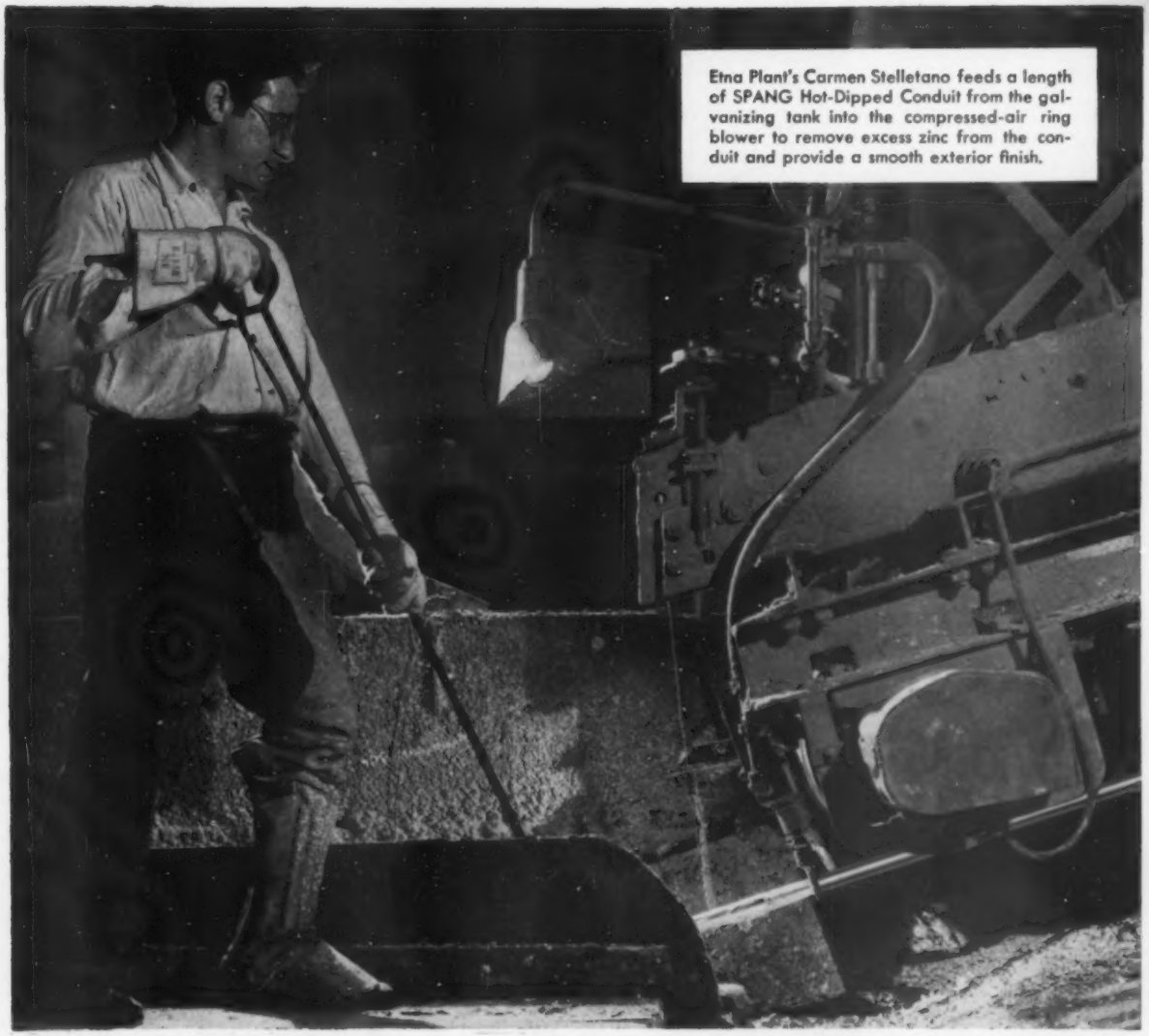
A completely new catalog (No. 526) of power connectors and bus support clamps is now available from Southern States Equipment Corp., Hampton, Ga., superseding catalog No. 525-R. Furnished in a handsome 7-ring binder, the new catalog includes sections on bus support clamps, couplers and angle braces, bar connectors, Tee connectors, stud connectors, ground connectors, parallel clamps, and terminals.

1257—Centrifugal Roof Ventilators

An 8-page, two-color folder (SDA-220) giving construction features, performance data, dimensions and recommended specifications for the new Centrifugal Roof Ventilator manufactured by The Peerless Electric Company, Warren, Ohio. Other important Peerless Fan and Blower products and a list of Peerless sales representatives are also included.

1259—Electrical Tapes

Twelve pages of specifications and application data make up an attractive booklet on Dutch Brand Electrical Tapes. Plastic, friction, and rubber tapes, as well as a vinyl tape made in nine different colors, are available from Dutch Brand Division, Johns-Manville, 7800 So. Woodlawn Ave., Chicago 19, Ill.



Etna Plant's Carmen Stelletano feeds a length of SPANG Hot-Dipped Conduit from the galvanizing tank into the compressed-air ring blower to remove excess zinc from the conduit and provide a smooth exterior finish.

Out of this galvanizing tank comes the best rigid conduit* you can buy!

*...*SPANG HD, of course!*

AND HERE'S WHY...

UNIFORM STRENGTH—SPANG HD Galvanized Conduit is produced under close control during forming and welding to provide a uniform conduit that's easy to cut, bend and thread.

HEAVY-DUTY UNIFORM FINISH—of prime western zinc, air-wiped outside to produce a smooth even finish that will stand up under severe bending strains . . . blown inside with superheated steam to provide easy wire pulling.

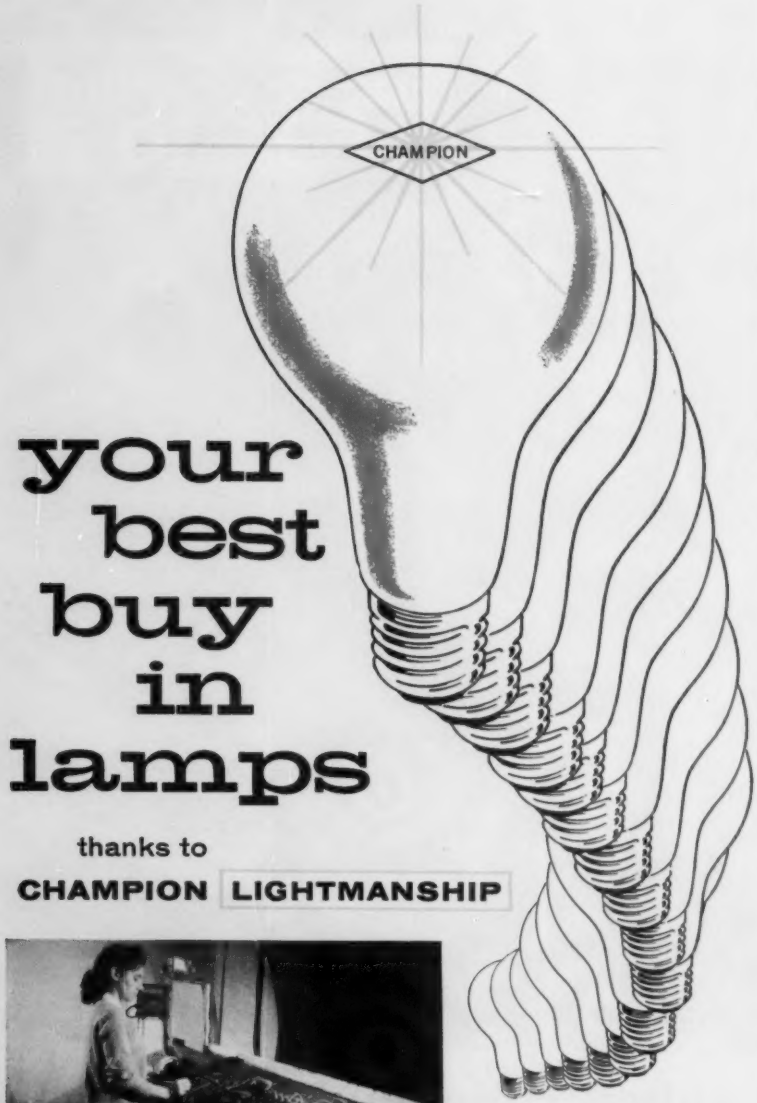
HIGH CORROSION RESISTANCE—Quick quenching of the hot galvanized conduit in a sodium dichromate solution gives a strong bonding of the finish to the steel . . . helps retard formation of white rust . . . adds extra service life to the pipe. A protective coating of lacquer provides added resistance to corrosion.

SPANG CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE
TWO GATEWAY CENTER, PITTSBURGH, PA.
District Offices and Sales Representatives in Principal Cities

NEXT JOB MAKE IT SPANG HD CONDUIT!

You'll get quality every time. Save money in the long run, too! There's a SPANG Distributor near you, ready to give you quality service on your order.



your best buy in lamps

thanks to
CHAMPION LIGHTMANSHIP

MILLIONS OF LAMPS A YEAR . . .
ONE PLANT standard of quality control

TEST . . . TEST . . . TEST . . . Continuous testing is one of the many ways Champion applies LIGHT-manship to make sure that every Champion Lamp is uniform in life and light output . . . that you don't have to worry about early burn-outs and early dim-outs when you use Champion lamps.

Send for the New MAINTENANCE MANUAL. 48 pages of practical suggestions for making the most of your lighting system.

CHAMPION LAMP WORKS
Lynn, Massachusetts
A division of Consolidated Electric Lamp Co.

CHAMPION Lamps
Incandescent Fluorescent
Your best buy in lamps

Enter Code Numbers of Catalogs Desired on Coupon on Page 6

1261—Cable Puller

The electrically powered cable puller manufactured by The Barth Corp., 12650 Brookpart Rd., Cleveland 30, Ohio, is described in a new booklet. This tool is ideal for industrial and commercial construction and maintenance.

1263—Conduit Fittings

Bridgeport Fittings, Inc., 209 Center St., Bridgeport, Conn., offers a twenty-six page catalog describing their line of conduit, bushings, lock nuts, couplings, nipples, supports, connectors, and other fittings. Size, weight, and packaging details are included.

1265—Wire and Cable

Simplex Wire & Cable Co. announces a new catalogue of the family of ANHYDREX insulated cables. Catalogue No. 1028, which supersedes Nos. 1017 and 1018, is available on request from Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

1267—Guy Strand

An Engineering Data Sheet—E. D. 1878—describing the new Copperweld Type M Guy Strand. Contains table of physical properties as well as instructions for dead-ending this new high-strength, non-rusting guy strand. Available from Copperweld Steel Company, Frick Building, Pittsburgh 19, Pa.

1269—Hydraulic Power

A new bulletin describing the two-speed, fast-approach portable power for hydraulic tools obtainable from hydraulic power pumps is offered by Greenlee Tool Co., of Rockford, Ill.

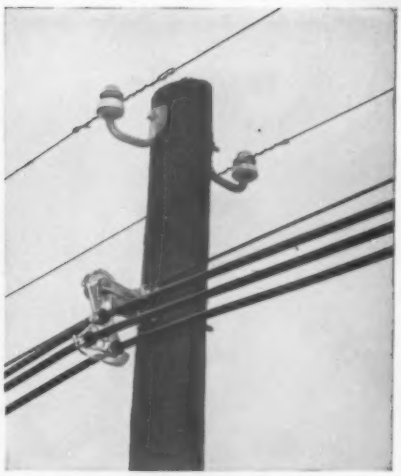
1271—Power-Strut Channel

Three new bulletins have been issued containing specifications and application data on Power-Strut channels and related devices manufactured by Power-Strut, Inc., Framingham, Mass. No. 550 describes its use as surface raceway and lighting support; No. 560, electrical cable and duct supports; 580, movable Power-Strut walls.

1273—Ventilators and Range Hoods

The Ventrola Mfg. Co., Owosso, Michigan, has available a new 12 page catalog describing in detail their entire line of Ventilators (both kitchen and bathroom) and Push-button range hoods. Installation instruction sheets of all models are also available.

New Roeclamp with Roeplastic® Cable Costs 60% Less than Self-Supporting Cables, Minimizes Tree Problems, Installs with Ease, Looks Better!*



New Roebling ROEPLASTIC Cable with ROECLAMP requires only one foot of clearance through trees! Note improved, compact appearance. No crossarms are needed.

Designed for 5kv systems (2400/4160Y and 4800 v delta) and 8kv systems (4800/8320Y and 7200 v delta), the Roebling Aerial Spaced Cable actually costs 60% less than conventional self-supporting cables. It provides a neat, compact appearance, improved voltage regulation, higher current-carrying capacity, and positive phase identification.

Up to three conductors can be carried by ROECLAMPS, which are suspended from a strong messenger. The messenger also provides protection against lightning and falling limbs.

Aluminum conductors come in 17 standard sizes and strand constructions, and are made with a greater number of finer strands for extra flexibility. Standard insulation is extruded ROEPLASTIC P-11R7 (other extruded insulations available). ROECLAMPS come complete with grommets to fit cables and messenger you order.

Ask your Roebling representative to show you the remarkable new ROECLAMP. He'll tell you more, too, about the unusual savings and improvements you can effect, or write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

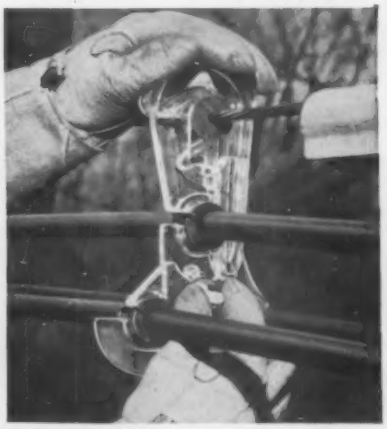
ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

Roeclamp has unit construction... installs in seconds—without tools!

One motion and ROECLAMP is on messenger and ready to receive conductors. Phase changes and repairs do not necessitate removal of clamp. ROECLAMP comes complete with grommets to fit messenger and conductors you order.

Note how easily conductors drop into place. Installation is measured in seconds, even with "boxing gloves" on. ROECLAMP is Plexiglas†, tests to over 1000-lb. breaking strength, offers outstanding weather resistance, best possible electrical properties.



35 ROECLAMPS are required every 1000 feet. Installation is completed by hand-tightening of nut. Not even a screw driver is required!

*Pat. pending
†Reg. T.M.—Rohm & Haas Co.

No. 1 of a series...

the dead-ends you never see improve the ones you buy

RESEARCH & ENGINEERING TEST SAMPLE
TYPE OF TEST: Corrosion
EQUIPMENT USED: Salt Fog Chamber
SPECIMEN NO.: 10
TEST STARTED: 3/24/58 9 a.m.
TEST TERMINATED: 5/23/58 2 p.m.

Most metallurgists and product design engineers are aware that laboratory corrosion tests have relatively little quantitative significance in terms of predictable service life. The only valid conclusion which may be drawn from such tests is that the particular samples tested had a certain relative resistance to the specific corrosive environment in which they were placed.

Nevertheless, corrosion proof-testing is considered an essential phase of product quality control at the Preformed Research and Engineering Center. In addition to conventional raw material quality control procedures, observations of relative corrosion rates are also made on finished products. As an example of objective performance standards used, Preformed Guy-Grip dead-ends are required to have corrosion resistance exceeding that of the strand for which they are designed. To assure compliance with these minimum quality standards, samples taken routinely from production are applied to strand specimens and exposed to a severe corrosive environment under closely controlled laboratory conditions. Periodic inspections are also made of field test specimens installed at locations throughout the country which are considered to be representative of extreme marine and industrial contamination. This constant laboratory and field surveillance has undoubtedly been largely responsible for the fact that there has never been a report of a Preformed Guy-Grip dead-end having failed in field service due to corrosion.

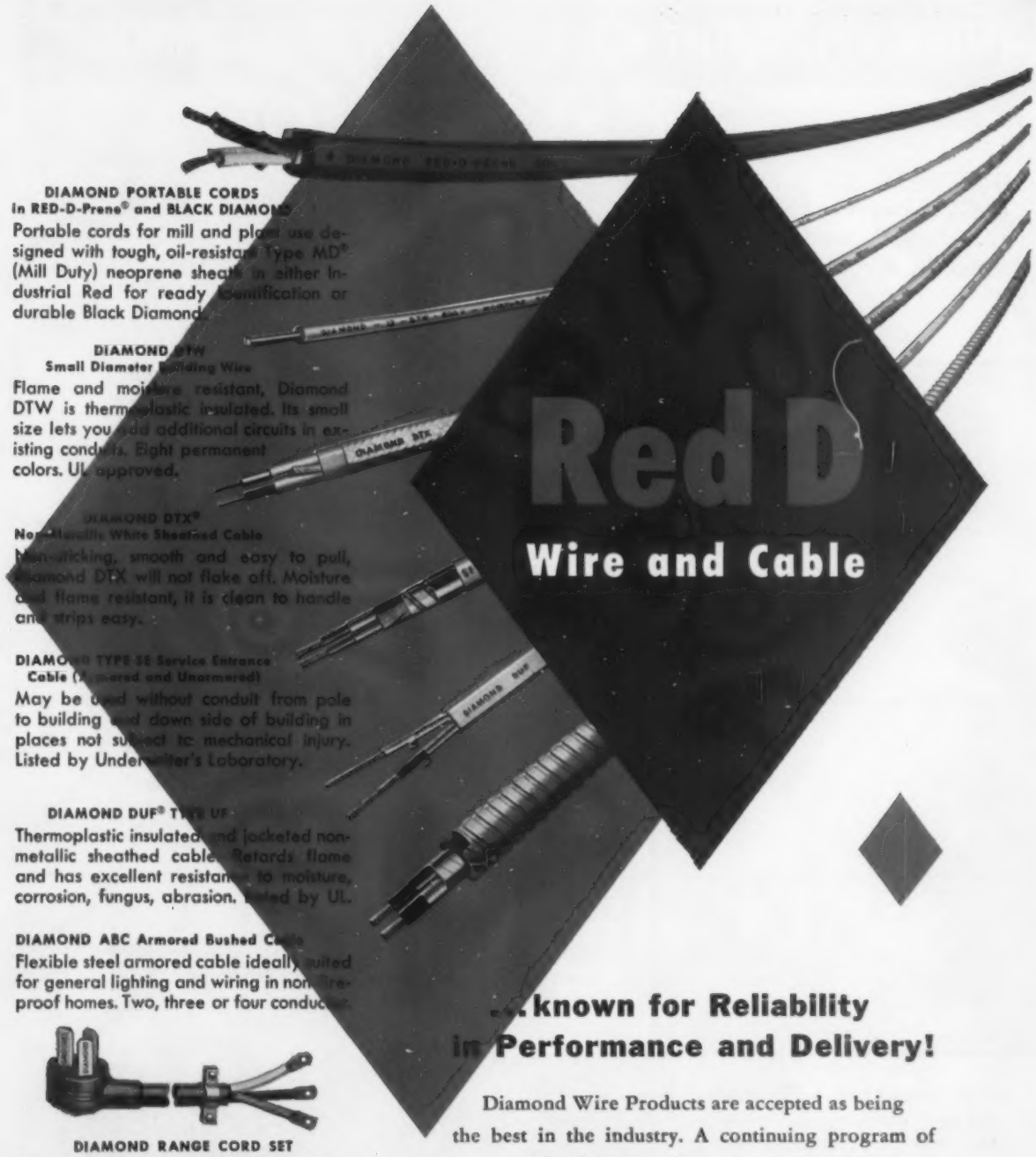
Jon R. Ruhlman, Vice President
Research and Engineering

Research and Engineering . . . another reason why . . .

You can look up to Preformed

PREFORMED LINE PRODUCTS COMPANY • 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable: Preformed-Cleveland . . . manufacturer of armor rods, dead-ends, Guy-Grip dead-ends and other line accessories.

* Made in accordance with or for use under Patent No. 2,761,273; other patents issued and pending.



DIAMOND PORTABLE CORDS
In RED-D-Prene® and BLACK DIAMOND

Portable cords for mill and plant use designed with tough, oil-resistant Type MD® (Mill Duty) neoprene sheath in either industrial Red for ready identification or durable Black Diamond.

DIAMOND DTW
Small Diameter Building Wire

Flame and moisture resistant, Diamond DTW is thermoplastic insulated. Its small size lets you add additional circuits in existing conduits. Eight permanent colors. UL approved.

DIAMOND DTX®
Non-Metallic White Sheathed Cable

Non-sticking, smooth and easy to pull, Diamond DTX will not flake off. Moisture and flame resistant, it is clean to handle and strips easy.

DIAMOND TYPE SE Service Entrance Cable (Armored and Unarmored)

May be used without conduit from pole to building and down side of building in places not subject to mechanical injury. Listed by Underwriter's Laboratory.

DIAMOND DUF® TYPE UF

Thermoplastic insulated and jacketed non-metallic sheathed cable. Retards flame and has excellent resistance to moisture, corrosion, fungus, abrasion. Listed by UL.

DIAMOND ABC Armored Bushed Cable

Flexible steel armored cable ideally suited for general lighting and wiring in non-fireproof homes. Two, three or four conductor.

DIAMOND RANGE CORD SET

Diamond three-wire range cord sets are 36" long. Have rubber molded cap, molded on rubber jacketed cable—are complete with steel strain relief. UL approved.

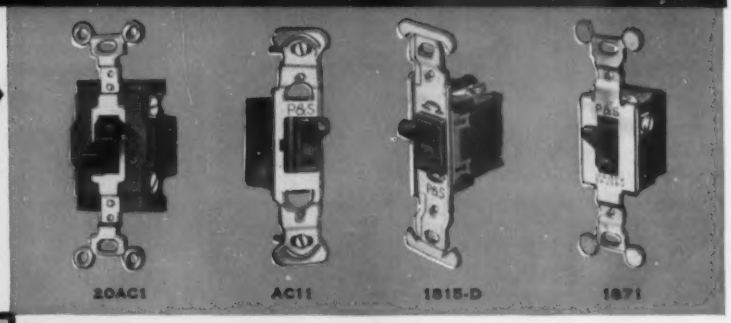
...known for Reliability in Performance and Delivery!

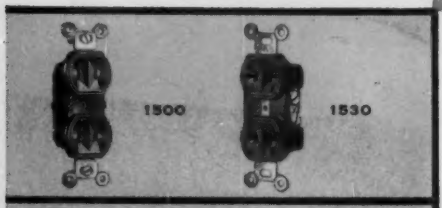
Diamond Wire Products are accepted as being the best in the industry. A continuing program of production control, research and product development helps maintain this reputation. And when your order for a Diamond product comes in . . . the goods go out, promptly and with no delay.

DIAMOND
WIRE AND CABLE COMPANY
Sycamore, Illinois
Birmingham, Alabama

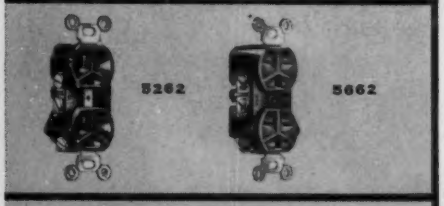
THERE'S A P&S QUALITY WIRING DEVICE FOR EVERY REQUIREMENT

SWITCHES – A complete line . . . heavy duty 20 Amp AC . . . T-Rated . . . residential . . . a switch for every job.



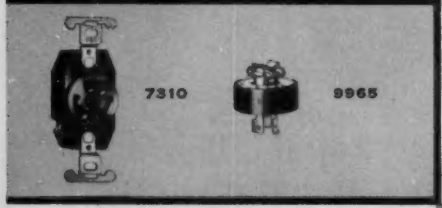


OUTLETS – A range to meet every need. Shown are the 1500 with time-saving screwless terminals and the 1530 T-Slot with dead back.



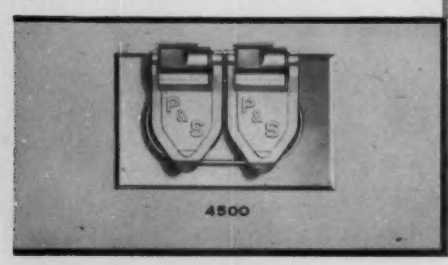
3-WIRE GROUNDING DEVICES – A full line of outlets, caps, connectors in 125 V and 250 V types.

POLARIZED DEVICES – Available in 2, 3, and 4-wire . . . 15 and 20 Amps . . . outlets, caps and connectors . . . all built to take a beating.



TURNLOK – Sturdily built outlets, caps, connectors . . . 2, 3, and 4-wire, 10 and 20 Amps.

DESPARD LINE – The original and only complete interchangeable line . . . super-compact, highly versatile. Combinations assemble in seconds with P&S-Despard camstrap.



WEATHERPROOF COVER – Makes any standard duplex outlet a weatherproof device.

Standardize on Pass & Seymour Devices

Write Dept. ES 758 for complete catalog

PASS & SEYMOUR, INC.
SYRACUSE 9, NEW YORK
60 E. 42nd St., New York 17, N. Y. 1440 N. Pulaski Rd., Chicago 51, Ill.
In Canada: Renfrew Electric Limited, Renfrew, Ontario

TEAR OUT ALONG THIS LINE AND FILE THIS FOLDER FOR REFERENCE

SRT Transformer

From the research and development laboratories of Line Material

A Revolutionary New Engineering Development

By **RODGERS G. WHEATON**
President
Line Material Industries

For over ten years, Line Material engineers have been working toward the development of a self-regulating distribution transformer. They have recognized that to apply voltage regulation to a line is most desirable; but that the place where load variations start is with the individual power user or small group of users.

Regulation—At the Load

Therefore, if the electrical industry can supply an unvarying voltage in the face of widely varying demands of the individual home or building, we will to a large extent solve one of the major operating problems of the industry.

The requirements were rigid. But the engineers have succeeded. Today Line Material announces the first Self-Regulating distribution Transformer —which we call the SRT.

Production To Be Increased

For the time being, the available number of SRT's is limited. We will increase production as rapidly as possible. Those now available will be sold to utility companies who are willing, for the benefit of the industry, to cooperate on a test program.

We are asking the companies who buy these SRT's to test them in various types of service where their operation and economies can be recorded.

Let Us Send You Information

If now, or in the future, you may be interested in cooperating in this test program, let us send you technical information that will better enable you to analyze your own opportunities for taking advantage of this outstanding new type of transformer. Phone, wire, or write: Line Material Industries, Milwaukee 1, Wisconsin.

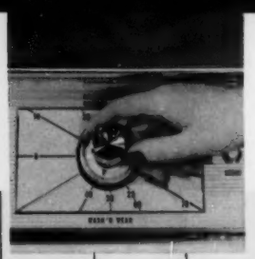
SRT

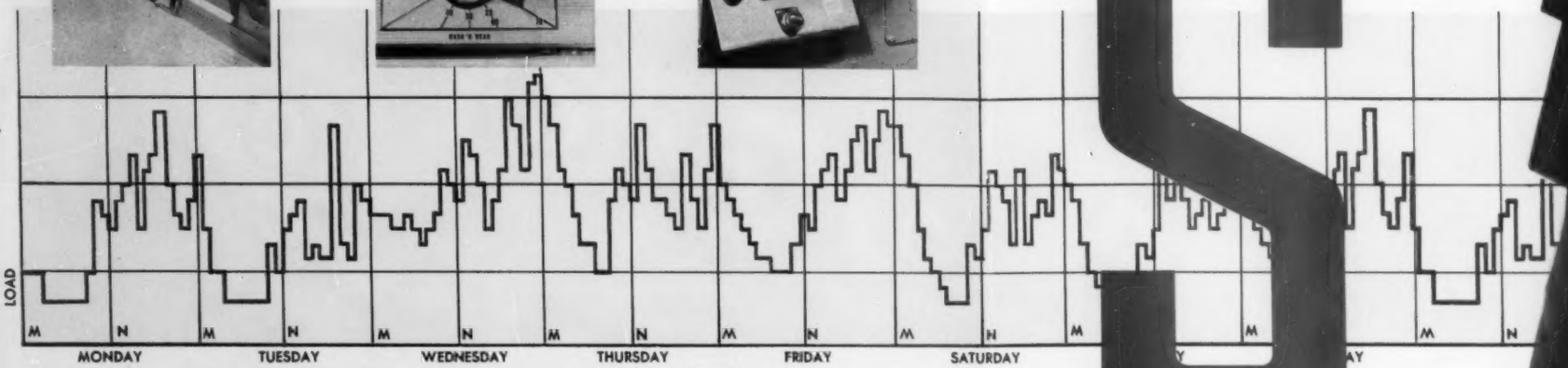
LINE MATERIAL Industries

McGRAW-EDISON COMPANY

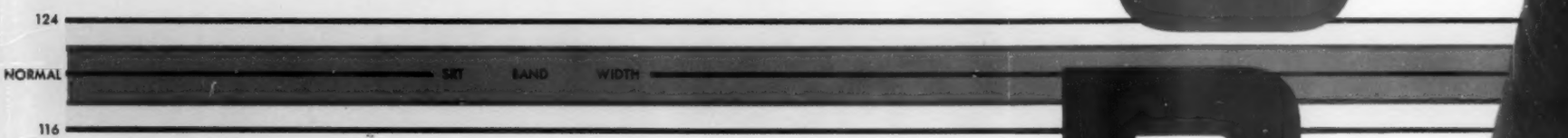
Distribution Transformers

McGRAW EDISON





Actual utility company load curve on a transformer for an August week (blue line).



With SRT, voltage would have been maintained within the band width (red line) under the above load conditions.

HOW THE SELF-REGULATING TRANSFORMER WORKS

By **RICHARD C. KIRK**
Manager of Engineering, Kyle Products
Line Material Industries

By **ROBERT P. THOMPSON**
Manager of Engineering, Transformers
Line Material Industries

The new L-M Self-Regulating Transformer consists of a Round-Wound® distribution transformer with extra taps on the *primary*, and a regulating mechanism that is volt-sensitive on the *secondary*. The device switches primary taps to change the transformation ratio as needed.

Meets Rigid Requirements

We have worked over ten years to perfect this system. It fully meets our rigid requirements—compactness, extreme reliability, and long life. One 2400 volt tap changer has now operated more than 250,000 times—equivalent to over 40 years' life on a 25 kva transformer.

"Adapt-a-Tap" Range Selector

A unique feature of SRT is the "Adapt-a-Tap" range selector. It provides a full 20% range within which the taps for the 10% automatic regulation, in four 2½% steps, may be selected, all below, straddle, or all above normal. Thus, SRT can be located *anywhere* on the line, at the end, the middle, or near the substation.

Nominal 3½-Volt Band Width

The midpoint is set at 120 volts. SRT operates whenever the voltage drops to 118¼ or rises to 121¾. Each operation occurs only after a time delay. This prevents undesirable operation or "hunting" on switching surges and momentary voltage variations outside the band width.

An Outstanding Contribution

We believe the application of voltage regulation to the individual customer to be of extreme value to the utility industry, and we are confident that the design of the SRT will fully meet the requirements set for it.

The SRT is a significant departure in the field of voltage regulation, because it corrects the voltage *at the point of use*. The SRT corrects overvoltage; it compensates for line drops and load increases.

Prevents Undervoltage

For example, if two or three customers turn on their ranges at the same time, causing a voltage drop, the SRT will, after a time delay, change taps and return the voltage to the desired level. If additional loads drop the voltage again, the SRT again brings it back up.

Prevents Overvoltage

Near the substation, where the primary voltage may be too high, the SRT prevents overvoltage from reaching the user. This greatly reduces burnouts of TV tubes, and of incandescent lamps—the latter a very obvious saving to a company with a lamp replacement program.

Increases Income For The Utility

It is a known fact that low voltage causes loss of revenue. By maintaining proper voltage, the SRT prevents the drop in billings caused by undervoltage, which in the aggregate can represent a considerable loss to the utility company.

Improves Customer Relations

With correct voltage, lights are brighter; television sets, clothes dryers, air conditioners, and other appliances operate at maximum efficiency; ranges heat faster.

Thus the SRT offers the utility savings, in several ways, and many opportunities for improved customer relations.

S

R

T

SRT—The Self-Regulati
distribution Transforme
consists of an L-M Rou
assembly with special
under-load tap change
the exclusive L-M regul
SRT's will be available

2400 volts, 10 through
4160 volts, 10 through
4800 volts, 10 through
7200 and 7620 volts,
12,000 and 14,400 vol

LINE MATERI

McGRAW-EDIS

gulating
former—
M Round-Wound
pecial taps and an
hanger (below) and
l regulating mechanism (above).
ailable in the following ratings:

rough 25 kva
rough 37½ kva
rough 50 kva
volts, 10 through 75 kva
00 volts, 10 through 100 kva

WHAT THE NEW SRT WILL DO FOR THE UTILITY COMPANY

By **A. R. WAEHNER**
Director, Transformer Sales
Line Material Industries

We believe the SRT is the greatest advance in distribution transformers since Line Material introduced the Round-Wound® design. Nothing like it has ever been available. We feel we have broken through a barrier of tradition and limitations imposed by historic design and manufacturing problems. Today, the new SRT offers a utility company an opportunity to improve its service and its revenue, with the use of a low-cost device that achieves very desirable results.

Better Revenue

What the SRT offers the utility company is a solution to the low-voltage problem—which causes low monthly billing and inferior performance of electrical appliances and lights for the individual customers. The conventional step regulator in the line can at best average out the voltage problems. The SRT corrects the voltage right at the point of consumption—the customer.

More Economical Regulation

Under normal conditions, SRT will prove more economical than other means of voltage correction. This opens unlimited horizons to the distribution system design engineer for more effective and efficient planning.

Available For Tests

The initial production run of these units will be sold to progressive companies to explore the benefits available from this new development.

We realize that all companies must of necessity keep their income up and their costs down. We feel that the SRT will make a substantial contribution toward both of these goals.

Get the Detailed Facts

L-M Field Engineers and Apparatus Specialists will be calling on our customers as quickly as possible to provide detailed information about the SRT. If you would like this information, please get in touch with your L-M Field Engineer, or phone or wire me at Line Material Industries, Milwaukee 1, Wisconsin. We shall be glad to provide you with the details about this revolutionary engineering development.

TEAR OUT ALONG THIS LINE AND FILE THIS FOLDER FOR REFERENCE

LM®

McGRAW EDISON

RIAL Industries
DISON COMPANY

Distribution Transformers

Here it is!

the world's first

Self-Regulating distribution Transformer

LINE MATERIAL INDUSTRIES • MILWAUKEE 1, WISCONSIN

SRT Transformer

TEAR OUT ALONG THIS LINE AND FILE THIS FOLDER FOR REFERENCE

Used by MORE CONTRACTORS than any other brand- BY MILLIONS EVERY YEAR!

Some surveys have shown IDEAL Connectors first choice by up to *5 to 1* over the next leading brand. *Maybe so!* The important fact — proved by continuing surveys — is that contractors just plain like IDEAL Connectors *better*, for *more* jobs than any other brand — by millions! They know they can depend on them to perform as promised.

In short, these contractors KNOW QUALITY — WANT QUALITY — and BUY QUALITY.

If you aren't using IDEAL Connectors, you're in a minority. *Better check your reasons* — or join the switch to America's top brand of Wire Connectors — IDEAL.

IDEAL

WIRE CONNECTORS

IDEAL Wire-Nuts® CONNECTORS

the lifetime-tight, wire crushing grip that NEVER LET'S GO!

- just screw them on — like a nut on a bolt!

Use new "Wire-Nut" wrench if you like.

Screw-and-lever and wedge action with FORCE OF UP TO 2½ TONS flattens wires and multiplies contact area

NOW — BETTER THAN EVER

Stronger!
Closer tolerances!
Easier to Use!

SHAKE-PROOF! PULL-PROOF!
FLASH-PROOF! HEAT-UP PROOF!

IDEAL CRIMP CONNECTORS with the UNIQUE "Wrap-Cap" (Patented) INSULATOR

A stronger crimp sleeve of cadmium plated steel, diaper-wrapped in perfect, pre-fabricated insulation all-around and double protected over wire ends. Best of the crimp connectors!

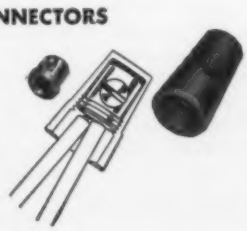
LISTED UNDER RECOGNITION SERVICE — UL — OF UNDERWRITERS LABORATORIES INC

All IDEAL Wire Connectors in all contractor sizes are UL listed as pressure cable connectors, for general use (600 V.) in branch circuit and fixture wiring.

SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS
In Canada: Irving Smith, Ltd., Montreal

IDEAL SET-SCREW CONNECTORS

Set 'em and see 'em! A screw driver's all you need. Permits visual inspection of every joint. A breeze to re-use when making circuit changes. *Solid brass* sleeve and set-screw — long-skirt, *highest dielectric* shell.



IDEAL INDUSTRIES, Inc.
1017-G Park Avenue, Sycamore, Ill.

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The South weathers recession best

By Richard P. Smith

President
W. R. C. Smith Publishing Co.
Publishers of Electrical South

For virtually all of his business life Dick Smith has kept a close watch on the economic development of the South. In this article he highlights the region's marked economic strength during a period of general business recession.

THE SOUTH has been weathering the "recession" distinctly better than other areas of the United States.

If you've been standing too close to your own problems to see how the Southland — the 16 Southern and Southwestern states—has continued to rise in the face of a temporarily slowed economy, step back a few notches and consider why we are blessed by living in an area which is now the nation's No. 1 economic asset.

From the facts and conclusions to follow, all of us should draw comfort from the clear signboards that the Southland—far more than any other area—is topping, Goliath-fashion, the less-well-situated regions.

The depressed state of business evident in the North, East, and West is much less noticeable in the South. Of all the various indicators you can examine, none reflects good jobs and public sentiment more quickly or more accurately than retail sales. People spending money freely are happy, confident people whose faith in themselves and their future is backed up with cash. In the South consumer buying continues to be heavy.

Over-all retail sales in stores other than the larger chains in March of this year exceeded those of February by $359 million and January by $66 million in Alabama, Florida, Georgia, Mississippi, Tennessee, the Carolinas and Virginias, Maryland, Delaware, Kentucky, Arkansas, Louisiana, Oklahoma, Texas, and the District of Columbia.

Of $3,326 million which cash registers rang up in March, $667 million was spent in food stores, $210 million in eating and drinking establishments, $186 million for general merchandise, $208 million for apparel, $176 million for furniture and appliances, $257 million for lumber, building materials, hardware, and farm equipment, $349 million at gasoline service stations, and $122 million for drugs and proprietaries, all of which showed increases in sales in March over February. March sales brought to more than $9½ billion the cumulative total of such transactions in the South in the first quarter of 1958, according to a Bureau of Census survey.

The increase in sales in March over February came in the broad

Moonlight and magnolias are still a part of the Southern scene, but don't overlook the constant broadening of the business horizon that makes the South the nation's No. 1 economic asset!

South, while the retail trade field in the Northeastern and North Central sections of the country were experiencing downtrends.

Employment better

Unemployment figures reveal that the South as a whole is relatively better off than other regions. Only seven percent of the South's labor force was unemployed in April (the last full month for which figures are available), whereas 7.8% of the workers were seeking jobs in the Northeast, 7.5% in the North Central region and 8.3% in the West.

In the year from April 1957 to April 1958 most of the unemployment in the South was registered in farm jobs. In April of this year 82.2% of the South's labor force had jobs in non-agricultural occupations; this was only 1.1% less than in April 1957. Thus far the greatest loss of jobs has been in Southern agriculture, where the drop has been 1.8% in a year's time, due primarily to continued farm mechanization and the attraction of industrial employment.

It is recognized that for retailers in the small-town market which comprises much of the South, no economic trend is more significant than the continuing rise in cash farm income. Retail trade in these rural areas is so closely linked to the fortunes of agriculture that as the farmer prospers so do the independent retailers.

Income received by Southern farmers in the year's first two months averaged more than eight percent above the 1957 period, and in mid-March national figures were at the highest level in five years. The annual rate of Southern farm income in the two months was $7.2 billion as compared with $6.6 billion a year earlier.

With farm income more than keeping pace with increased costs of production items, the U. S. Department of Agriculture predicts that net farm income for 1958 will be five to 10 percent ahead of 1957.

This increase then in *net* farm income is the significant fact, for it signals:

1. An improvement in the farmer's ability to purchase.

2. His re-entry into the market for virtually all categories of products.

Recent trade surveys by this company have revealed the soundness of the independent retailers' competitive position in this important small-town market as contrasted with the position of many of their big-city brothers. In the rural towns and cities—locations free of the domination of department stores, mail-order outlets, and discount houses—price structures tend to remain firm, and profit margins are more dependable. In most areas of the South dealers are free of such competition and buy with the confidence that traditional margins can be maintained. Irresponsible price cutting and sales with limited profits are *not* characteristics of the Southern market, and therein lies much of the strength and importance of the small-town retailer.

Business investment up

While the reactions of millions of Southern consumers are of vital economic importance, the reactions of businessmen also have an impact on the Southern economy that cannot be ignored. Perhaps the best gauge of business sentiment is the 5.8% increase in Southern business incorporations which was recorded in 1957 over 1956. However, you cannot realize the full impact of this fact until you contrast it with a national average *which showed a 4.1% loss.*

Since 82.2% of Southern workers are in non-agricultural jobs, manufacturing rates a large share of the credit for our present satisfactory situation. Perhaps the principal reason the South has not experienced the same business drop that has hit other regions is that our plants are larger and the products are more basic—processing raw materials through initial stages. We have relatively fewer finishing plants. Consequently, periodic changes in consumer demand are dampened somewhat before affecting our large processing industries.

Let's try to look simultaneously in two directions—at the big processing plants that we now have in the South, and at the coming finishing plants that will convert these processed materials into finished products to meet a fast-growing consumer demand. We already have an enormous stake in the processing industries and an equally important potential in the finishing plants that are rapidly developing.

Percentage growth enormous

Now the picture is changing rapidly. Many small new industries are being established to furnish supplies to the older big plants, and while the total of consumer products plants is not yet impressive, percentage growth is enormous. These trends will continue at a more rapid pace.

One outstanding example serves to substantiate the above statements: Electrical machinery and equipment.

General Electric and Westinghouse have led the parade. There are now 22 major G-E plants in our area, producing transformers,

(Continued on page 111)

"For retailers in the small-town market that comprises much of the South, no economic trend is more significant than the continuing rise in cash farm income. Retail trade in these rural areas is so closely linked to the fortunes of agriculture that as the farmer prospers so do the local trades."

Rotating discs control lights whose colors and intensity can be adapted to ballroom functions.

Antique chandeliers combine with contemporary rotating discs in unique lighting installation

By Margot Mejia

This article should be especially helpful to the following readers:

Electrical Contractors	✔
Electrical Utilities	✔
Electrical Wholesalers	✔
Electrical Inspectors	✔
Industrial Engineers	
Consulting Engineers	✔

◆ A ROMANTIC ATMOSPHERE, versatility of operation, and simplicity of control—a big order for a lighting installation but the most desirable combination for hotel ballroom illumination.

When Houston's Rice Hotel began an extensive remodeling program, architect Kenneth Franzheim and the decorating firm of Business Interiors settled on the use of lights manufactured by the Wendel Western Corporation, of New York and California. The subcontract for electrical facilities was awarded to Britain Electric Company.

The new Crystal Ballroom of the hotel is 50 feet wide and 213 feet long, arranged so it can be divided into as many as five smaller rooms. Each of these rooms can be converted into 15 different sizes with its own individual lighting and sound system.

The entire area is lighted with 65 Wendel lights. At the base of the light's vertical axis is an 18-inch disc mounted horizontally to the floor. In the disc are six holes for versatile changes of lighting effects. One hole is open for maintenance, one is a clear glass lens for spotlighting and the others are various shades of pink and red lenses. The lenses are ground to flood evenly the area under the rotating discs.

Almost any arrangement is possible with the lights—delicately colored tints can be rotated for dancing and white spots can be thrown on speakers, entertainers, models or displays. Because the lights are wired on an X-type hook-up, banks or rows of them can be turned on or off for special purposes.

A master control board permits selection and rotation of the selsyn-motored lights in any one or all of the room set-ups. A second interlocking control panel in the ballroom provides for separate adjustment of lighting in that area.

Adding a less contemporary note of decoration to the Crystal Ballroom are two antique chandeliers obtained by the decorating firm from India. They had hung for more than 100 years in the palace of the wealthy Nizam of Hyderabad. Made at a French crystal works in 1840, they were recently

(Continued on page 105)

Resort hotel modernizes wiring for air-conditioning

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers ✓

◆ IMPROVING the comfort and convenience attractions at Palm Beach Biltmore Hotel, West Palm Beach, Florida, is the modern electrical system just installed throughout the 10-story building under the supervision of the hotel's architect, Howard Chilton.

The new electrical system updates luxury facilities at the tradition-steeped Biltmore and helps bring air conditioning accommodations to each of the hotel's 528 guest rooms. Installation of the new facilities represents one of the largest rewiring operations in the Palm Beach area.

The electrical renovation was handled by Seaboard Electric Co., local electrical contractors. Economic considerations required the use of surface mounted materials. Neat appearance of the system was an absolute stipulation of hotel management.

Seaboard owners Frank Pilleggi and Fred Seelmann, Jr., selected lay-in type metal moldings and fittings for the project, using more than 23,000 feet of surface raceways produced by National Electric Products Corp. Painted to blend with the background, National's raceway numbers 888 and 333 resulted in a finished attractiveness complementing the hotel interior.

With the early-winter convention and vacation season in the offing, the need for speed in accomplishing the electrical renovation was mutually recognized by both the hotel management, owner—West India Fruit & Steamship Co., and the electrical contractor.

The selected surface raceway molding lent itself to fast, efficient installation of the over-all system. Seaboard electrician George Martin was especially impressed with savings in time achieved in "going around corners and beams in the hotel."

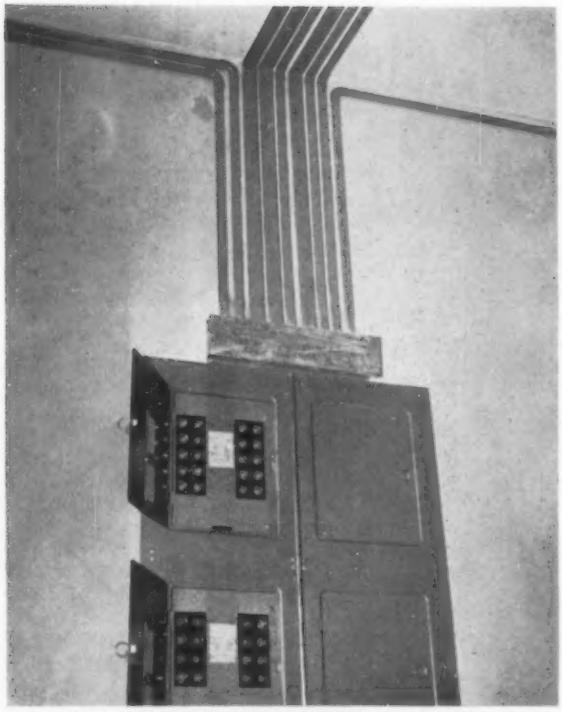
Design features of the two-piece metal molding permitted easy fastening of the base—even in areas where plaster surfaces were irregular. Bendability properties of the raceway saved valuable time and allowed neater mitering of the base and cap.

Acknowledged as the greatest "time saver" by most of the Seaboard Electric Company electricians who worked on the project, however, was the application of the "lay-in principle of wiring."

Use of National Electric's 888 and 333 metal molding permitted electricians to utilize fibre retaining clips to hold the full capacity of eight and ten wires in place during installation.

Noting the calendar requirements for finishing the renovation before the start of the resort season, Seaboard electrician H. T.

(Continued on page 105)



Entering the service panel above, are runs of metal molding which carry wiring for the new electrical system at the Biltmore Hotel, West Palm Beach, Fla. The neat installation of surface raceways was made by Seaboard Electric Company.

No fishing required! Fibre clips retain full "wire fill" in base as Seaboard Electric Company electricians place cover on run of surface raceway metal molding, above, which they found easily bends and fastens around corners.

Seaboard Electricians H. T. Duncan, T. E. Lamb and G. W. Martin demonstrate how full capacity "wire fill" of surface raceway was made in one operation. Two-piece cap and base construction of metal molding

contributed to fast and efficient installation of the new electrical system by permitting use of the "lay-in" system of wiring. Metal molding has been painted to blend with hotel interiors.

Streamlined record system for electrical

JOB DETAILS

JOB NO. 5000

CHARGED TO: Mr. James Stevens, P. O. Box 100, Anytown, U.S.A.

LOCATION: 305 S. Main Street

INSTRUCTIONS: Install receptacles as directed

DATE OF INVOICE — YOUR ORDER 2/26/58

QUANTITY DELIVERED	QUANTITY RET'D	QUANTITY NET	DESCRIPTION OF ITEMS	MATERIAL PRICE	MATERIAL PER	MATERIAL AMOUNT	COST UNIT	COST AMOUNT
23 78		53 148	12/2 Romex Cable	6.50	C	9 62	3.65 M	5 45
10		3 7	#9595 Hubbel Recpts.	.62	ea	4 34	.35 ea	2 31
10		3 7	#91101 " " Plate	.13	"	91	.07 "	56
10		3 7	#11 - Romex Switch Box	.48	"	3 36	.25 "	1 75
10		3 7	#796 Switch Box Supports	.16	"	1 12	.09 "	56
6		2 4	3/8" Romex Connectors	.13	"	52	.08 "	32
50		8 42	1x9 Wood Screws	.01	"	42	.50 C	21
00		11 89	Romex Staples	.75	C	68	.35 C	31
50		6 44	1½x5 Wood Screws	.25	C	93	.32 C	14
1		1	#RH-102 Stablok Panel	8.30	ea	8 30	4.65 ea	4 65
2		2	#NA-20 " Breakers	2.80	"	5 60	1.71 "	3 42
6		6	100 w. Lamps	.22	"	1 38	.12 "	72
2		2	Attachment Plugs	.10	"	20	.06 "	12
TOTAL MATERIAL AS SHOWN ON INVOICE				TAX 1 10		36 78		20 42

WEEK ENDING	EMPLOYEE	THU	FRI	SAT	SUN	MON	TUE	WED	LABOR HOURS	LABOR RATE	LABOR AMOUNT	COST RATE	COST AMOUNT
2/21	George	4	2						6	3 90	23 40	2 50	15 00
2/21	Bill	4	2						6	2 50	15 00	1 50	9 00
TOTAL LABOR AS SHOWN ON INVOICE											38 40	OVERHEAD 12 00	24 00

Fig. 1—Back of Accounts Receivable Ledger Card.

BILLING MASTER

JOB NO. 5000

CHARGED TO: Mr. James Stevens, P. O. Box 100, Anytown, U.S.A.

LOCATION: 305 S. Main Street

INSTRUCTIONS: Install receptacles as directed

DATE OF INVOICE — YOUR ORDER 2/26/58

FEE DETAILED LIST ATTACHED MATERIAL	LABOR R	TAX	OTHER CHARGES MEMO	CODE	AMOUNT	AMOUNT OF INVOICE
36.78	38.40 +	1.10		24	3.50	79.78 *

CODE OF OTHER CHARGES: 1-TRAVEL EXPENSE 2-PERMITS AND FEES 3-OUTSIDE SERVICES 4-SPECIAL INSURANCE 5-DELIVERY CHARGE

ENTRY

Fig. 2—Billing master can be easily reproduced for invoicing.

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ A LOW-COST bookkeeping machine has been adapted by the National Cash Register Company to fit in with the integrated bookkeeping and job record system developed by the National Electrical Contractors Association for electrical contractors.

Over 85 per cent of all electrical contractors with annual sales less than $900,000 are reportedly still using pen-and-ink methods of bookkeeping. To most of these contractors the new system will be their first experience with a machine system.

Basic plan for the NECA system originated over four years ago with a desk model bookkeeping machine installation in the office of Elwood Peele, an electrical contractor in Burlington, N. C. The set-up was designed for Peele's firm by a Greensboro, N. C., certified public accountant, W. Burton Hair. The NECA staff has developed the system and adapted it for universal use by electrical contractors. For example, the association has designed standard forms to simplify installation of the system, and also prepared a complete manual of instructions. Upon request, the association furnishes member contractors advice and assistance regarding forms and equipment for their specific type and volume of business.

Besides the advantages of speed, simplicity and accuracy gained through mechanization, the new system provides a contractor with these specific benefits:

1. A simple, fast billing operation which permits billing immediately upon completion of a job.

2. One centralized record—an accounts receivable ledger card—containing complete information about costs, billing, and payments on every job.

3. A profit or loss figure on each job at the time it is billed.

4. Increased profit through better management and the savings that result from fast, efficient machine bookkeeping.

How the system works

The system combines the functions of a two-total bookkeeping machine and a spirit duplicator to produce job records, billing, and accounts receivable records; to produce a complete cost analysis of each job along with a sales summary; and to provide for mechanization of accounts payable, payroll, and general ledger. Bookkeeping work flows like this:

Upon receiving an order, the bookkeeper types the customer's name and address, location of the job, job number, date of order, and instructions on a duplicating form known as the "Job Master." This form is used to duplicate headings on all forms required at the job location and in the office:

(1.) Electrician's Field Sheet, (2.) Billing Master, (3.) Customer's Invoice, (4.) Duplicate Invoice (plus extra copies if required), (5.) Office Copy of Invoice, (6.) Accounts Receivable Ledger Card, (7.) Supplemental Time Sheet (when size or type of job requires it), and (8.) Detail of Material and Labor Charges.

The original shipment of material for a job is listed on the Job Master and duplicated on the Electrician's Field Sheet. This form serves as a work order for the electrician when he starts a job. As work progresses, the Electrician's Field Sheet is used to record time worked and any additional material for the job.

Additional material is added to the Job Master at the time it is sent to the job and returned material is deducted after being checked in. Upon completion of the job, the Electrician's Field Sheet is turned in to the office where the labor costs are transferred to the Job Master. The total cost and price of material and labor are then calculated and these totals are entered on the Job Master along with the amount of sales tax and overhead.

When completed the Job Master

(Continued on page 109)

Fig. 3—Bookkeeping machine in operation.

FRONT — ACCOUNTS RECEIVABLE LEDGER CARD

JOB NO. 5000

CHARGED TO: Mr. James Stevens, P. O. Box 100, Anytown, U.S.A.

LOCATION: 305 S. Main Street

INSTRUCTIONS: Install receptacles as directed

DATE OF INVOICE: 2/26/58

YOUR ORDER

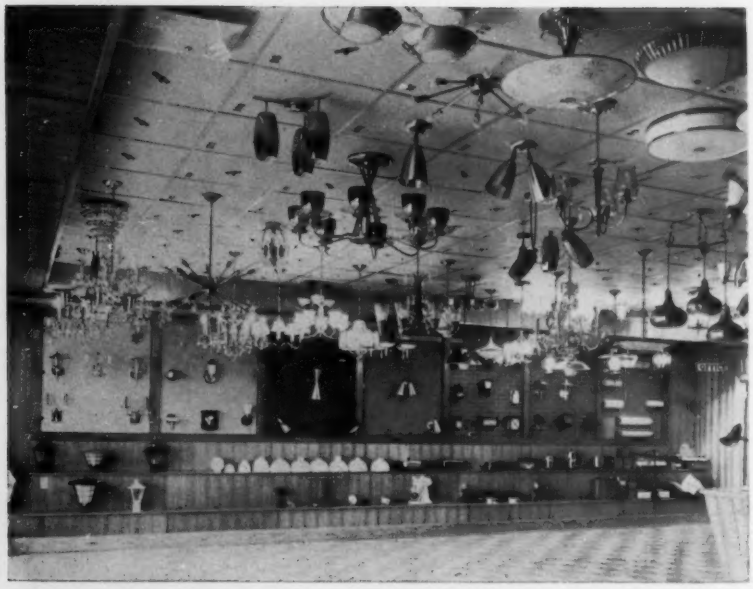
PER DETAILED LIST ATTACHED			OTHER CHARGES			
MATERIAL	LABOR	TAX	MEMO	CODE	AMOUNT	AMOUNT OF INVOICE
36.78	38.90 +	1.10		24	3.50	79.78 +

ACCOUNTS RECEIVABLE	DATE	REFERENCE	CHARGES	CREDITS	BALANCE OR DATE PAID

DIRECT JOB EXPENSE	DATE	REFERENCE	CHARGES	CREDITS	BALANCE
	FEB 28 '58 P/J	1	3.50		3.50 +

Fig. 4—Front of Accounts Receivable Ledger Card has three main parts.

Pushbutton console controls lighting fixture display



When this Mississippi supplier completely remodeled an old building, turning it into a modern showroom and warehouse, a main objective was to provide facilities for efficient display of lighting fixtures.

An underfloor duct conceals control wires leading from numbered ceiling panels to the console, where numbered pushbuttons correspond, in turn, to a catalog number, thereby streamlining fixture sales.

By Leo Blackwell

Engineer
Southern Electric Supply Co., Inc.
Meridian, Mississippi

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ WHEN SOUTHERN Electric Supply Co., Inc., recently moved to larger quarters in Meridian, Miss., one of its objectives was to provide facilities for efficient display of lighting fixtures.

The ceiling display, as shown in the accompanying illustration, made use of the versatile inverted tee grid system. In addition, Kindorf strut was placed above the ceiling for a triple purpose: to support the ceiling, to serve as raceway for power supply, and to support outlet boxes every four feet (containing four low-voltage relays and two duplex receptacles).

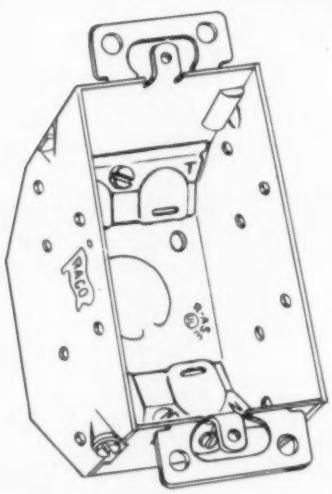
Ceiling grids are 2 x 2 feet square with sixteen rows of fourteen units making a total of 224 fixtures on display—all individually controlled.

Control wires are concealed in an underfloor transite duct which runs to a console where numbered pushbuttons correspond to numbered ceiling display panels.

Thus our sales personnel can light fixtures on display via the console and turn to corresponding fixture numbers in a catalog. Thus lighting sales are streamlined in Southern Electric Supply's new fixture showroom!

As a distributor of electrical supplies, our company makes use of its permanent fixtures also as sales aids. Offices have luminous ceilings, an Electrend forced air heat-

(Continued on page 106)



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SWITCH AND OUTLET BOXES

Have all These Quality

Advantages

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- Wide-slotted screws with tapered points for easy starting
- Deep, clean-cut threads on screws and tapped holes
- Smooth edges — no burrs or slivers
- Made of heavy gauge steel
- Uniformly bright electro-galvanized finish
- Engineered to exceed local and national code requirements

WRITE FOR CATALOG TODAY

YOU CAN ALWAYS RELY ON RACO

"A RACO BOX FOR EVERY NEED"

ALL-STEEL EQUIPMENT INC. Aurora, Illinois

Jet-propelling line through conduit

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers ✔
- Consulting Engineers

◆ SOUTHERN ELECTRICAL contractors have ingeniously adapted principles of jet propulsion in their field of endeavor to shoot line through conduit in seconds—a job which, by old-fashioned "snaking" methods, once required hours.

Said to have been invented and developed by experienced North Carolina electricians, the Jet Line Gun—manufactured by the Jet Line Gun Co. of Charlotte, N. C., and distributed nationally by Graybar Electric Co.—has proved its ability to send a line around multiple ells and bends—up to 100 to 150 feet in average conduit, and more than 400 feet in straight dry runs.

Gun-loading process

A packaged spool of sturdy nylon line is attached to a sealed cartridge of liquified gas which, in turn, is muzzle-loaded into the gun. After insertion into the conduit, a trigger actuates a "firing pin," puncturing a hole in the cartridge which, in turn, releases the jet action of compressed liquified gas. The cartridge then travels through the conduit at high speed, laying a line behind it, finally dropping out at the conduit exit. The contractor is then able to draw a heavier line through the conduit and pull the wire.

Nylon line for the operation is available both in cans and packages. Attached to the gun, a can dispenses twine, tied to the cartridge, at a rate allowing an average 150-foot shot in most general runs. For longer and more complicated runs, use of the line package, tied five to 10 inches behind the cartridge, is recommended. In the latter instance, the package travels with the cartridge to reduce friction.

According to the manufacturer, the gun's utility was initially gauged in three specific tests, each under varying conditions.

In Test A, both line package and can were utilized with a cartridge, successfully fired for a 250-foot run through 1½-inch conduit. The cartridge traveled eight feet vertically, passing three 90° ells, and one offset.

In Test B, a cartridge with line

(Continued on page 110)

When loaded with a liquified gas cartridge and fired, the Jet Line gun has proved its ability to send line around multiple ells and bends.

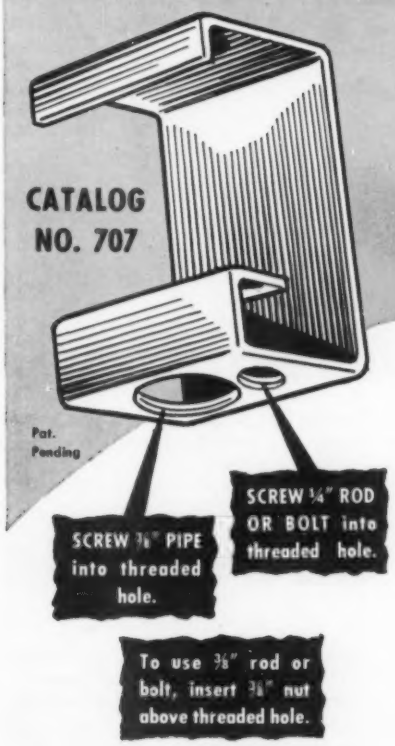
Complete gun kit comes equipped with various adapters to facilitate conduit line shooting and eliminate old-fashioned snaking methods.

TERRIFIC IS THE WORD FOR IT!

TOMIC'S NEW 707

Snap-On ALL PURPOSE FIXTURE CLIP

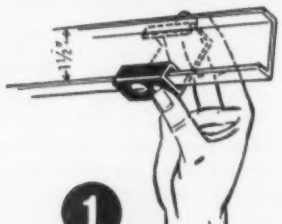
CUTS INSTALLATION COSTS BY 50% AND MORE


CATALOG NO. 707
Pat. Pending
SCREW ¼" ROD OR BOLT into threaded hole.
SCREW ⅜" PIPE into threaded hole.
To use ⅜" rod or bolt, insert ⅜" nut above threaded hole.

IN HANGING FIXTURES TO SUSPENDED CEILINGS

Tomic's new SNAP-ON ALL PURPOSE FIXTURE CLIP is cleverly designed to use inexpensive 1½" lathing channel for mounting flush, surface or stem fixtures from the suspended ceiling framework. SNAP-ON FIXTURE CLIPS readily snap on the channel at any point — require no bolts or screws for attaching — are adjusted from below even after the ceiling tile is in place.

Now For The 1st Time . . . You Can Hang Fixtures As QUICK And EASY As ONE-TWO-THREE!



1 SLIP

Slip threaded end of Snap-Ons over bottom of channel.

2 SNAP

Snap over top of channel

3 SCREW

Screw nipple or rod through Snap-Ons until it butts against channel. That's all.

Immediate Delivery • Sample On Request

TOMIC SALES & ENGINEERING CO.

ORIGINATORS and Manufacturers of Cable, Tap-On and Twist-In Fittings

20,000 Sherwood Ave. • Detroit 34, Michigan

Zarin Electric's residence heavy-ups in Washington area last year topped '56 volume by 35 per cent. Above, firm electrician Ken Huffer installs fuse panel in old basement. Huffer ties cables in junction box to operate light on three-way switch in home on which new utility room is being added.

Cashing in on home heavy-ups

By Benjamin Zarin
Zarin Electric Company
Washington, D. C.

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers
- Consulting Engineers

◆ A FINE POTENTIAL in residence heavy-ups awaits any electrical contractor willing to avail himself of the opportunity.

Our '57 volume in heavy-ups was 35 percent over '56. The drastic change in living conditions brought about by up-to-date electrical appliances has outmoded electric services in older homes.

While manufacturers have done an outstanding job by newspaper, magazine, radio, and TV to present the comforts and conveniences of modern electrical living, the public is largely unaware of the inadequacy of yesterday's 15-ampere service to take on today's washer, dryer, air conditioner, freezer, wishwasher, and other electrical units.

In Washington, where housing has not kept apace with population growth, and real estate companies are buying old homes to remodel, there are some 35,000 outmoded residences. This presents a vast opportunity for the electrical contractor.

Our 40 years of electrical contracting here have given us wide contact with real estate companies and builders, and these are one of our chief sources of heavy-up jobs. In rehabilitation of apartment houses and modernization of private residences, installation of air conditioning, automatic laundries, water heaters, and other electrical equipment calls for service of an electrical contractor.

Emergency call leads

The emergency call usually furnishes a lead to a needed heavy-up job. Here the contractor must do an educational job. He may go into a 30-year-old home where there is a refrigerator, wall heater, and washing machine on one central cord hanging, like an octopus, from the ceiling. He may have to explain, in most elementary fashion, why a fuse was blown as the family tried to squeeze the last ampere of electricity out of a 15-ampere service. He must point out the excessive demand on the service, the hazards involved, and the limitation of an old, inadequate service on the addition of new appliances. He must stress how important it is to replace the wiring in the home for convenience, comfort, and safety.

Our 24-hour emergency service may yield one heavy-up job out of 10 calls. Future volume sometimes grows out of the call for an electrician after 8 o'clock in the evening. When you have helped a home out of difficulty, goodwill has been established. Also, you have planted an idea that modern living can be available only with modern wiring.

Referrals frequently bring us heavy-up jobs, as also does our classified telephone book advertisement on adequate wiring and emergency service.

Our first step on an emergency call is to look for cause of short circuit. We pull all plugs and attachment cords, look for defective wiring, and warn the customer against further use until replacement has been made. If the customer agrees to heavy-up the service (and in most cases the idea is grasped very readily, while costs present the real problem), we notify the power company of our rewiring job. They have to run new wires into the house, work on which has to be scheduled. An en-

(Continued on page 106)

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High-speed approaches to the new Baltimore Harbor Tunnel are well lighted by four-lamp, six-foot fluorescent luminaires which provide a maintained level of illumination of 0.6 footcandles.

Fluorescents illuminate tunnel approach

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✔

◆ THE NEWLY COMPLETED installation of fluorescent highway lighting luminaires is now providing vision-engineered illumination for nighttime users of the new Baltimore Harbor Tunnel.

A total of 826 four-lamp, six-foot General Electric luminaires have been installed along the 16 miles of four-lane approach roadways leading to the city's new 1.7-mile tunnel that has eliminated the former highway bottleneck between New York and the South.

Using the new tunnel route, travel time through Baltimore has been cut by as much as 34 minutes for motorists traveling via U. S. 301 between the North and the Glen Burnie-Annapolis area. From north to south via the tunnel and U. S. 1, travel time has been reduced by 18 minutes.

Maximum safety provided

J. E. Greiner Company and Green Associates, Inc., Baltimore consulting engineering firms, designed the roadway lighting system to provide maximum safety for after-dark motorists and economical operation for the State of Maryland. Fluorescent luminaires were selected on a basis of their uniform level of virtually glare-free illumination and low cost of operation, maintenance, and lamp replacement.

Each of the four-lamp luminaires is equipped with two two-lamp ballasts. One ballast is connected to one 480-volt circuit, while the other is connected to a second 480-volt circuit. Each ballast serves two lamps located on opposite sides of the luminiare reflector. This arrangement provides the added advantages of lighting continuity at 50 per cent capacity in case one of the two circuits fails. Roadway lighting units operate from a total of four 480-volt, three-phase, 60-cycle circuits—two on either side of the tunnel.

Operating at full capacity, the lighting system provides a maintained illumination level of 0.6 footcandle.

Continuous lighting has been installed on the high-speed approaches which pass through urban areas where background lighting from homes and illuminated signs provide distracting influences to motorists. In rural areas, however, illumination is provided only at "danger areas" such as access roads, interchanges, and underpasses.

In areas where lighting begins

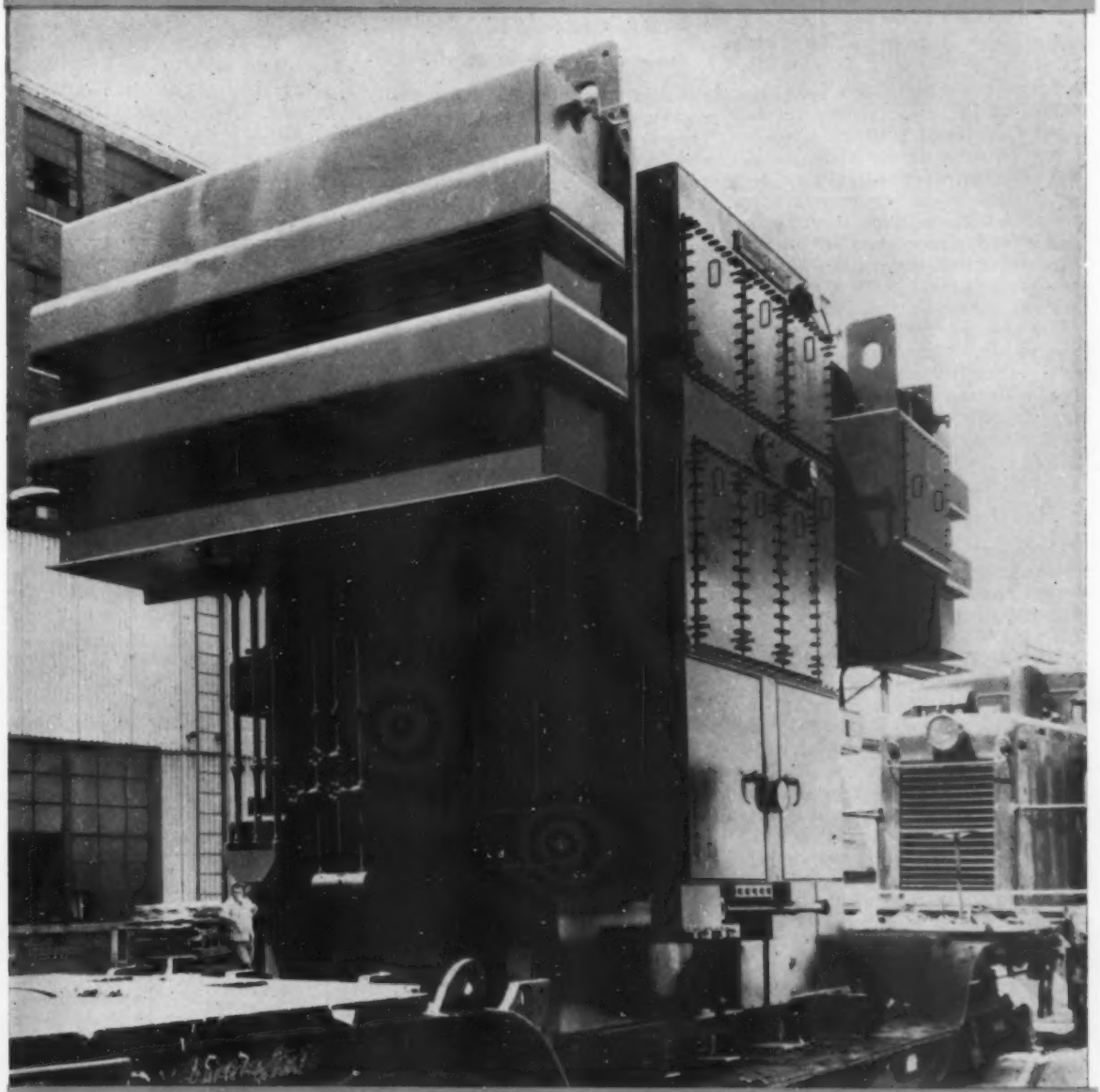
(Continued on page 105)

UTILITY ENGINEERING

Transmission — Distribution — Metering

Design
Installation

Testing
Maintenance



SEA WATER WILL COOL IT—This unusual appearing transformer, built for a Freeport, Texas, plant, will be cooled with sea water circulated through copper-nickel cooling coils. This design reduced floor space by 70 per cent; weight by 35 per cent; and exposed cooling surface by 90 per cent.

New protection methods increase value of series capacitor usage

By Jack Davey
Electrical Engineer
Louisiana Power and Light Co.
New Orleans, La.

◆ SERIES CAPACITORS have been installed on the Louisiana Power & Light Company's system to solve a load fluctuation problem on a long 13.8 kv distribution line. It has proved to be an economical and reasonable solution to voltage flicker and motor starting problems and should become one of the standard solutions in the distribution engineer's bag of tricks.

The reason for the installation of this particular bank was the seasonal cotton ginning load in the area with the attendant voltage dips caused by frequent motor starting cycles. "Before" and "after" voltage charts are shown in Figure 3.

Local system conditions

The electrical data of the Galion series capacitor and of the local system conditions are as follows:

Distribution system, 13.8 kv grounded Y.

BIL (capacitor units), 75 kv.

Ohms per phase, 13.8 ohms.

3 phase kva, 450 kvar.

Full load current, 104 amps.

Voltage across capacitor at full laod, 1,440 volts.

Positive sequence source impedance, 11.4 + j 11.6 ohms.

3 phase faults on line side of capacitor: with capacitor, 690 amps; without capacitors, 490 amps.

Calculated voltage swing when starting 100 hp motor across the line with a 1,400 kw steady state load: with capacitors, 0.44%; without capacitors, 4.8%.

Series capacitors are to be considered under the following conditions:

1. There is a frequently changing load surge, the rate of change of which is too rapid for the standard mechanical type voltage regulator to follow.

2. The load surge is predominantly reactive.

3. The source impedance is predominantly reactive. (Note: Our application was not an ideal one from this standpoint.)

Resonant condition solutions

Series capacitors have two well known technical disadvantages. They are subject to ferroresonance, a resonant condition between the capacitors and the distribution transformers on the system causing an overvoltage on the capacitors and the transformers.

They are also subject to subsynchronous resonance, a resonant condition at less than 60 cycles causing the motors to run at a subsynchronous speed and to draw heavy currents. Both of these conditions can be remedied by the installation of a shunt resistor around the capacitor bank, the value of which is from 8-10 times the series capacitor ohms.

Another solution to these resonant phenomena would be to have an electrically operated oil switch which will close to short the capacitor bank any time the source voltage is lost.

In our case the switch closes to short the bank ten seconds after voltage is reestablished and remains closed for a predetermined time after restoration of voltage and finally opens electrically. The economics of this type arrangement are attractive when compared with shunt resistors because of the high I^2R losses in the resistors.

For instance, suppose it was decided to parallel the bank with a resistance eight times the bank rating, or, in our case, a 110 ohm resistor. The current through the resistor at full load on the capacitor bank will be (13.8/110) × 104 = 13 amps.

The watts lost in the resistor at full load will be 18,600 watts per phase or 55.8 kw for the bank. For a 55% load factor the annual cost of these losses will be 55.8 x $21.80 = $1,215.00.

This will justify an expenditure of approximately $6,000 to eliminate the I^2R losses plus the cost of resistors.

System fault protection

In the past, another serious shortcoming of the series capacitor has been the protection of the bank during overvoltage conditions caused by system line side faults. One of the possibilities in designing a series capacitor is that it be built to carry the system fault current.

Keeping the series ohms constant, the size of the bank (measured in the number of capacitor units used or in kva) varies directly with the square of the current rating. As an example, a normal

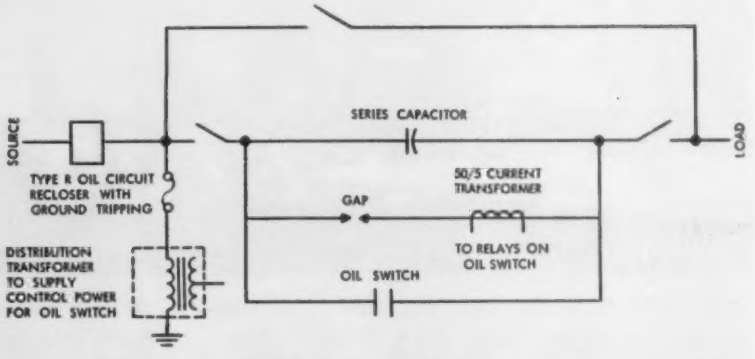


Fig. 1—Protective scheme used by Louisiana Power and Light Company on Galion 13.8 kv series capacitor bank totaling 450 kvar.

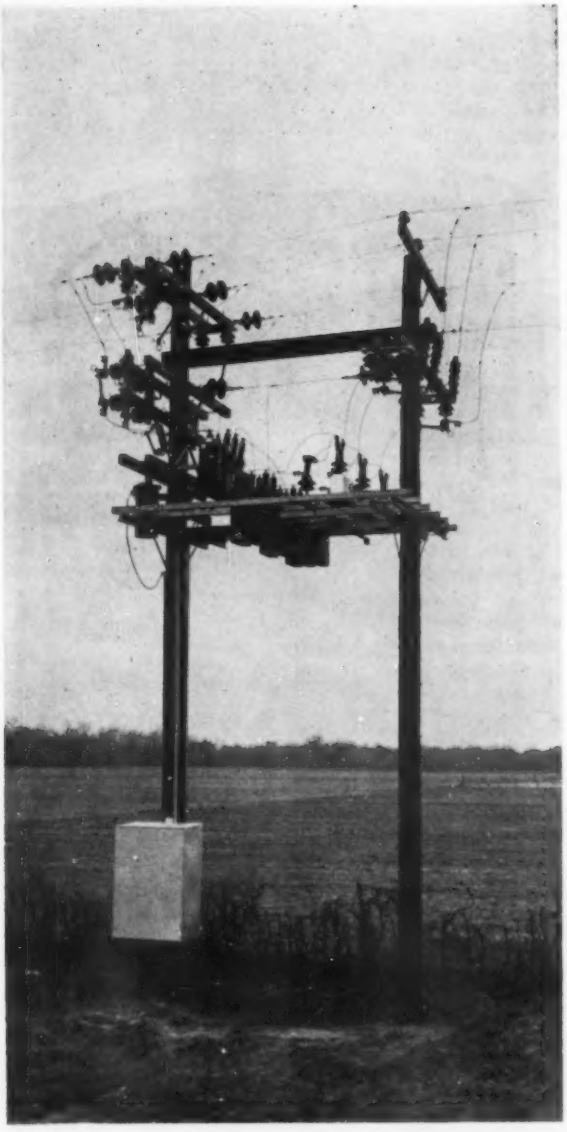


Fig. 2—Louisiana's seasonal cotton ginning loads with the accompanying voltage dips, caused by frequent motor starting cycles, dictated installation of the 450 kvar Galion series capacitor bank.

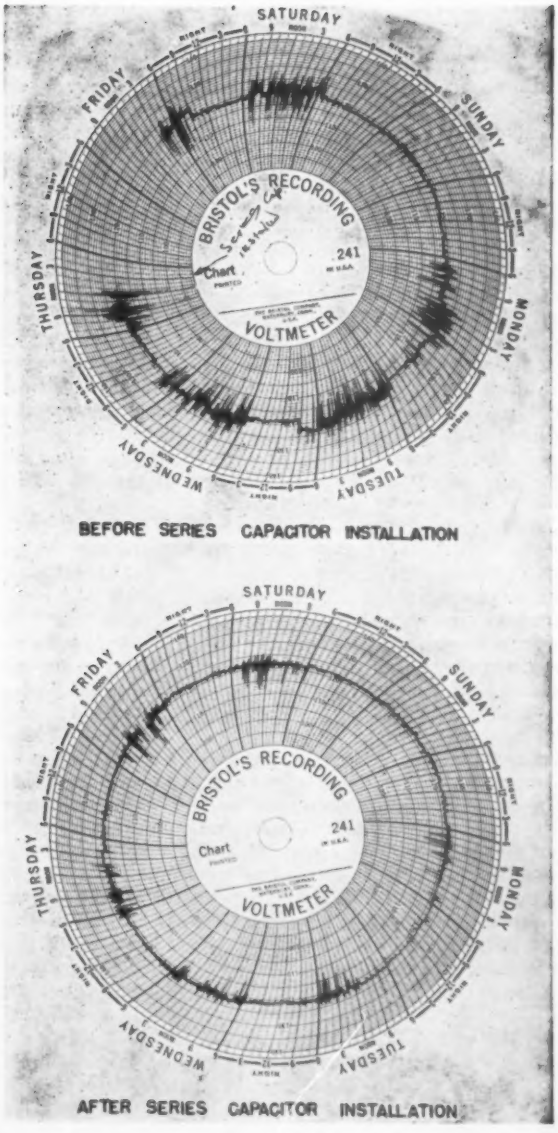


Fig. 3—Voltmeter charts show voltage "before" and "after" installation. A frequently and rapidly changing load surge which was predominately reactive made the series capacitor installation feasible.

ratio between fault and load current is ten to one. The bank would then have to be 100 times larger to carry the system fault and thereby eliminate the need of protecting the bank from the high IXc voltages that occur during system faults.

This is an impossible solution, of course, and has led to considerable experimentation on gaps that will short the bank on overvoltages and yet extinguish on rated voltage. It has always been possible to build a gap that would fire over at a predetermined voltage plus a small tolerance; the problem was to extinguish the arc once the overvoltage condition has vanished.

It appears that a simple reliable overvoltage protective gap has been developed, cut away views of which are shown in figures 4, 5 and 6. As shown in Figure 5, one of the electrical terminals of the gap in the vertical shaft, the other is the housing. As shown in the sketch, the arc initiates between the gap electrodes and travels up by convection and by motor action to the spiral electrode and the housing. The gap here is much longer and the arc is being spun around by the magnetic field of spiral electrode and so it extinguishes at a high voltage.

The gap is set to fire at 2.5 times the bank rated current and it has been found to extinguish at 1.5-2.0 times the bank rated current.

The protective scheme that was used on our series capacitor bank is shown in Figure 1. The other important part of the protective

equipment is the source side three-phase oil circuit recloser. Since the shorting gap does not fire until the voltage across the bank is 250%, the bank is unprotected for overvoltages between 100% and 250%. The purpose of recloser is to cover this band. Recloser is of heavy duty type and equipped with ground tripping set to trip at 67 amps.

The minimum phase tripping on the recloser is 200 amps. On ground tripping, which accounts for about 98% of the faults, the recloser adequately protects the bank since the bank will carry 104 amps and the recloser trips at 67 amps. The calculated risk is taken that when a three-phase fault occurs, the impedance at the fault will be so little that the fault current will be large enough to cause shorting gaps to arc.

Since little was known about the gap performance and since this was an experimental bank, a current transformer was placed in the gap circuit to close the electrically operated oil switch and short the gaps.

This oil switch is then operated on a predetermined schedule with an ordinary reclosing relay, and if current no longer flows in the gap, the switch would remain open and the reclosing relay reset. Gaps have proven to be self-clearing and shorting switch has not had to operate.

In this bank, full BIL capacitors were used and the cases operated grounded; however, some cost savings can be affected by buying the BIL rating that goes with the capacitor terminal to terminal rated voltage and mounting the capacitors on insulators. These cost savings must be weighed against the safety considerations that are sacrificed since in our company the service people are used to having all capacitor cases grounded.

Internal bank failures

The possible internal bank failures and the methods by which they will be handled are as follows:

1. Open circuit—An open circuit in one of the capacitor units will cause an overvoltage on the parallel units and will probably cause one of these units to fail (short out) eventually. This, however, is a very rare type of failure and can only be detected by inspection and possibly testing with an ohmmeter.

2. Short circuit—The most common type of failure will be to have a capacitor unit to short out internally. This will short one phase of the series capacitor and create an impedance unbalance in the distribution line. On heavy loads the line side recloser may be tripped on ground current. This condition can only be detected by inspection.

It is recommended that the capacitor units that are to be used in a series capacitor bank be given d-c high pot tests before installation and be tested periodically afterwards.

3. Short to case—This will trip the line side recloser and should be easily found when the line is inspected. The fact that severe damage will be done to at least the faulted unit even more emphasizes the importance of d-c high pot tests. This, however, should not be a problem if the capacitor units are mounted on insulators.

The total installed cost of this capacitor bank is $4,710 which compares quite favorably with the $9,200 installed cost of three single-phase 100-ampere pole top voltage regulators. This comparison is not quite fair, however, since these two devices are competitive only on slow rate of change load cycles where the regulator will correct for both kilowatt and kilovar swings whereas the series capacitor is effective only on kilovar swings.

Series capacitors appear quite attractive on fast rate of change load cycles where the only other possible answers are:

a. The construction of a new circuit paralleling the existing one.

b. The installation of bundle conductor on the existing circuit.

c. The construction of a new bulk type substation as near the load or loads causing trouble as possible.

For instance, suppose it is necessary to supply a 13.8 kv standby feeder to a 2,000 kw induction motor load having a fast automatic load transfer scheme at 13.8 kv. Suppose there is an existing 10 mile 13.8 kv 336.4 MCM ACSR circuit available and that the voltage during the restarting cycle of the motors should be no lower than 70%.

If this circuit is uncorrected, the restarting voltage across the motor load will be about 63.8%. Using a 7.2 ohm per phase series capacitor the source impedance will be lowered so that the voltage across the load will go no lower than 70%.

The current capacity of the bank should be about 250 amps making the three-phase kva about 1350. Since resistors will probably be required on this bank, the estimated installed cost is about $12,500. This will be considerably less than any other method of lowering the source impedance.

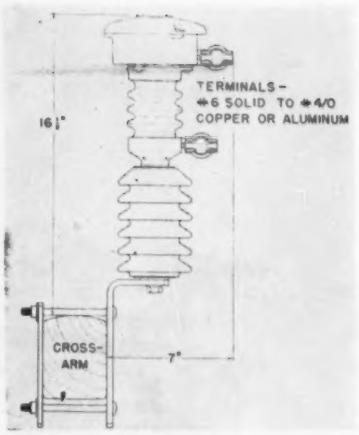


Fig. 4—Simple overload protective device extinguishes arc when overvoltage condition has vanished.

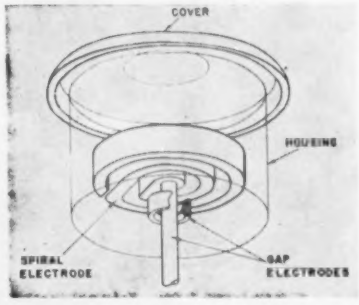


Fig. 5—One of the electrical terminals of the overvoltage protective gap is the vertical shaft, the other is the housing.

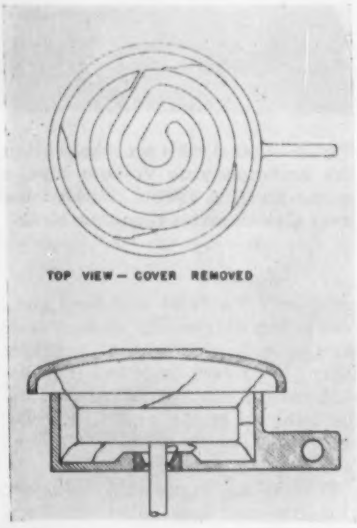


Fig. 6—Position of arc at various stages during operation of the overvoltage protector is indicated by wavy lines.

Triplex secondaries for Jacksonville

◆ RESIDENTIAL areas in Jacksonville, Fla., are now being served from 1/0 triplex secondaries in place of the usual open wire secondary, reports Cyrus Washburn, chief engineer for the Department of Electric and Water Utilities, of Jacksonville. Although the department has been using triplex service drop for a number of years, this is its first venture in the use of triplex secondary.

The adoption of triplex secondaries is one of the measures taken recently by the department to modernize its distribution system and improve service continuity with respect to outages resulting from tree conditions and other faults.

The department's secondary system design provides for service drops to be taken off the triplex secondaries about 18 inches out from the pole, thus allowing better climbing space on the pole.

Photos show triplex secondaries and service drops in new residential areas served by Jacksonville's Department of Electric and Water Utilities.

Distribution transformer has built-in regulator

◆ A SELF-REGULATING distribution transformer designed to consistently maintain proper voltage on 120/240-volt secondary systems was previewed in Chicago recently by a selected group of utility executives and industrial magazine editors.

Designated SRT, the new transformer has been designed by its manufacturer, Line Material Industries of Milwaukee, Wis., to improve electric service and increase consumer satisfaction.

At the same time, it provides the electric utility distribution engineer with a device which will enable him to solve economically and effectively many of the problems brought on by rapid load growth in residential areas.

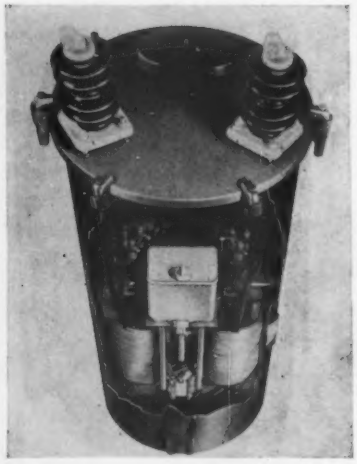
The transformer itself is a standard Round-Wound transformer with additional features to make it self regulating. The voltage sensing and tap actuating mechanism is hermetically sealed in the square box shown in the accompanying cut-away view. The hydraulic actuating mechanism transmits its motion through a drive shaft to the tap changer shown below the mechanism box.

10% regulation range

Regulation is accomplished by changing the transformation ratio in 2½ per cent steps over a voltage range of 10 per cent. The effective band width is 3½ volts centered around a base voltage of 120 volts. A special feature, called "Adapt-A-Tap" by the manufacturer, permits manual selection of the desired range of regulation. With respect to rated primary voltage, the regulation range can be from 90 per cent to 100 per cent, from 95 per cent to 105 per cent, or from 100 per cent to 110 per cent.

The latter feature adds greatly to the flexibility of application of the new unit as it makes the self-regulating transformer practical for locations close to substations where voltage may be higher than average as well as locations at the far end of laterals where voltage may be considerably below average during heavy loading periods.

The voltage sensing and actuating mechanism is a relatively simple device immersed in hydraulic fluid and sealed in a metal case. It was designed with a view of providing a device which would require little maintenance and would



Cut-away view of the new self-regulating transformer introduced by Line Material Industries. The voltage sensing and actuating mechanism is in the hermetically sealed box in foreground. Below it are the voltage regulating taps. Behind the metal box at left and right are the links which permit selection of the regulation range: 90% to 100%; 95% to 105%; or 100% to 110%.

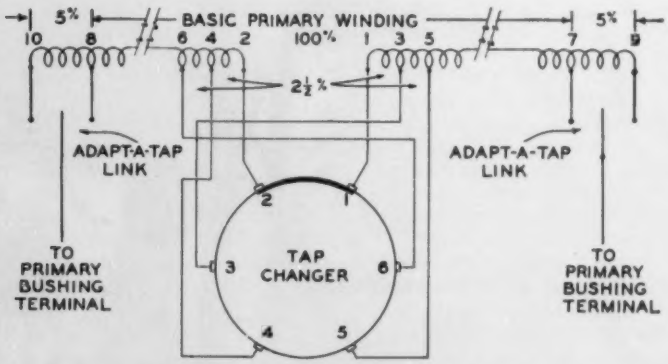
have a life expectancy equal to that of the transformer. Its operating features include a time delay which prevents hunting and unnecessary responses to momentary voltage fluctuations. Another feature is its temperature compensation which provides reliable operation of the sensing mechanism over a temperature range of —40 degrees C. to 150 degrees C. The voltage regulating mechanism requires only 12 watts for its operation.

Initially, the SRT will be available in a range of sizes from 10 kva to 100 kva. Primary voltage range of the smallest units will extend from 2,400 volts to 14,400 volts while the largest unit will be available only for primary voltages of 12,000 to 14,400 volts.

The units can be connected for any of the standard secondary distribution systems: two-wire, single-phase, 120 volt; three-wire, single-phase, 120/240 volt; three-wire, three-phase Y, 120/208 volt; four-wire, three-phase Y, 120/208 volt; three-wire, three-phase, 240 volt open delta; four-wire, three-phase open delta combination light and power.

Application is flexible

A wide range of applications can be visualized immediately, and un-



Schematic diagram of self-regulated transformer. The mechanism senses voltage at the secondary level but regulation is achieved by means of a primary tap changer which regulates voltage in four 2½% steps. By means of the two two-way links, called "Adapt-A-Taps," at extreme left and right of the diagram, the voltage regulation range can be set for 90% to 100%; 95% to 105%; or 100% to 110%.

The application of the new self-regulated transformers was effectively demonstrated on this analog device which permitted similated installations at three points on a primary feeder: close to substation; half-way out on feeder; and end of lateral. In the picture, left to right, are R. P. Thompson, manager of transformer engineering, A. R. Waehner, director of transformer sales, and R. G. Wheaton, president, all of Line Material Industries division of McGraw-Edison Co.

doubtedly the ingenuity of distribution engineers will result in many special applications. The most obvious application is that of raising low voltage to end consumer complaints. It is also suited, by virtue of its "Adapt-A-Tap" flexibility to reducing voltage for customers located close to regulated substations.

SRT will have applications relating to load growth problems. These self-regulated transformers can maintain voltage levels and keep pace with new loads in rapid-growth areas.

Another application is the possibility of saving regulator investment on a long line serving a few customers, and on regulated lines the application of SRT's is said to permit more effective use of regulating equipment.

The application of SRT's will also serve to increase revenue by raising the average voltage at the utilization point, thus increasing power flow to lighting and resistance-type loads.

How it works

The design and operation of the SRT mechanism was explained at the Chicago meeting by R. C. Kirk, manager of Kyle products engineering for Line Material.

"The 'brain' or mechanism within the container performs three functions: (1) senses the secondary voltage, (2) pumps a hydraulic fluid in which it is immersed, and (3) transmits motion to the tap changer through the drive shaft. Since it is sealed, it cannot become contaminated or affected by foreign material.

"To discuss what is accomplished, let us assume the range of regulation is 100 per cent to 110 per cent and a gradual voltage rise above the 120-volt normal setting occurs. The mechanism senses the secondary voltage rise and becomes alert for a tap change. It incorporates an inherent time delay that prevents unnecessary responses to momentary voltage fluctuations. This time delay is approximately 40 seconds for the first tap change from the neutral position, but only about 20 seconds for successive changes in the same direction. As soon as the rising secondary voltage reaches 121¾ volts, which is one-half of the 3½-volt band width above 120, and the time delay has elapsed, the mechanism effects the tap change. As a result, secondary voltage drops to 118¾ volts.

"Now at this voltage, the mechanism senses that secondary voltage is below the 120-volt normal. It prepares, therefore, to produce a correcting tap change in the plus direction. This change would occur, after time delay, only if secondary voltage falls below 118¼ volts. If the rising voltage condition persists and secondary voltage goes above 120 volts, the mechanism starts preparing for another minus change. Briefly then, SRT constantly senses secondary voltage and constantly acts to maintain an average value of 120 volts."

SRT's vs. regulators

In discussing the application of SRT's to utility distribution systems, R. P. Thompson, manager of transformer engineering for Line Material Industries, pointed out that "Application of SRT's will, in many instances, make the use of distribution voltage regulators unnecessary. In other situations, SRT's will supplement regulators. A judicious use of both regulators and SRT's on a particularly long line will maintain desirable voltage levels at all points and permit more distance between individual regulators. SRT's are equally applicable on systems where a combination of regulators and capacitors are now used for voltage regulation.

"The principal difference between a regulator and SRT is in the ability to recognize individual voltage conditions at the utilization level. A regulator responds to net voltage change on the portion of the system it is feeding. In other words, all of the voltage changes along a primary feeder are integrated and the net change is sensed by the regulator control. A regulator cannot correct for individual transformer impedance drop or for low voltage at any one transformer installation. At the time one transformer is heavily loaded, other transformers along the feeder may be lightly loaded. To the regulator control, the integrated voltage appears the same as when the feeder is moderately loaded along its entire length.

"An SRT, on the other hand, senses voltage right at the distribution transformer. It senses on the secondary voltage side and consequently corrects for transformer impedance drop. Every distribution transformer, in effect, becomes a regulator! Each SRT makes voltage corrections that conventional regulators cannot make because of system and feeder diversity."

The economics and marketing of

(Continued on page 112)

Artist's conception of Project EHV, General Electric's prototype power line that will attain super voltages higher than ever used by man for the transmission of electric power. Four-and-a-half mile experimental line, carrying up to 750,000 volts, will be built soon near Pittsfield, Mass.

Project: Extra high voltage

◆ PLANS TO TRANSMIT electric power at super voltages, higher than ever before transmitted, have just been announced by the General Electric Co.

A full-scale prototype transmission system General Electric will build is scheduled to carry power at a maximum of three-quarters of a million volts and later may be altered to send million-volt power. The 750,000 voltage is higher than that of any existing power line in the world and more than twice the highest operating transmission voltage in the United States.

The General Electric line will be energized at 460,000 to 500,000 volts in its first year of operation and at 600,000 to 750,000 volts in its second and third years.

Dependent upon further consideration at that time, the line may be reconstructed and the voltage raised to hit the million mark.

At 750,000 volts, the line would be capable of carrying all the electric power needed by a city of a million persons (Cleveland).

European countries, notably Sweden, Russia, Germany and France, are now operating lines at 400,000 volts and are planning others at higher levels.

EHV line to be built

The General Electric line, called Project EHV (extra high voltage) will be built next year near Pittsfield, Mass., headquarters of the company's Power Transformer Department, which is co-ordinating the project. It will be four and one-half miles long.

The project will cost over $5,000,000 in funds, equipment and engineering talent contributed by 15 operating departments of General Electric and four cooperating companies, with guidance from an advisory council representing the electric utility industry.

Project EHV is one of the major efforts beginning during Operation Upturn, the company's broad program to help combat the recession.

Participating companies include Western Massachusetts Electric Company, which will later take over and operate the EHV line as part of its transmission system; Aluminum Company of America, which will supply the steel-reenforced aluminum conductors that carry the power, also conductor accessories; and a supplier of steel towers. Also participating is Stone & Webster Engineering Corporation, which is surveying the right-of-way, designing the line in collaboration with G-E engineers, and will be in charge of constructing the project.

Since the advent of the alternating current electrical systems 70-odd years ago, the trend has been toward higher and higher transmission voltages for sending power over distances with minimum loss. Highest now in use are 345 kv (345,000 volts) in America and 400 kv in Europe. Short experimental lines have been built at higher voltages, up to 500 kv in this country and 650 kv in Russia, for testing purposes but not for actually carrying power.

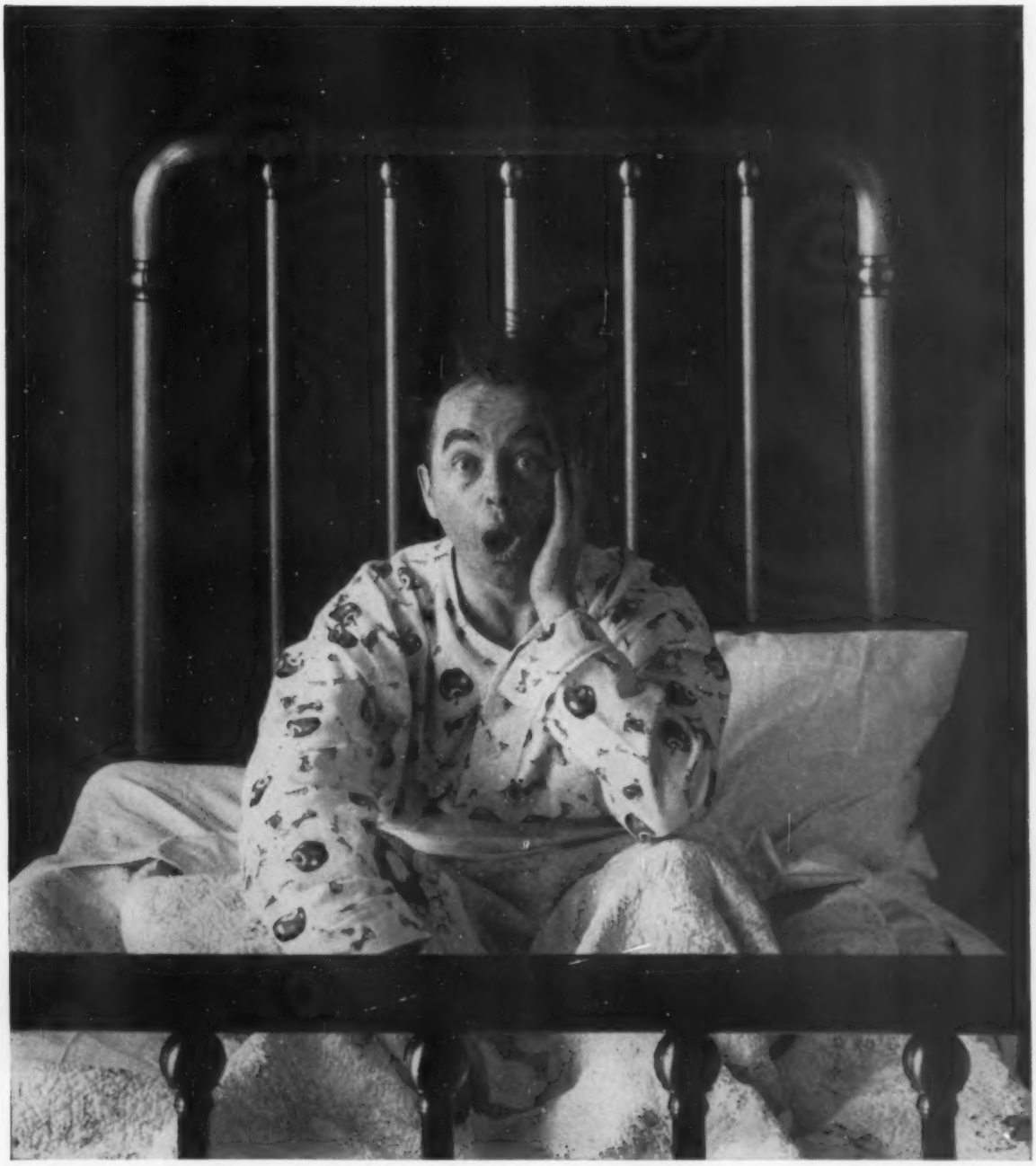
5-year program planned

Project EHV is carefully coordinated systematic five-year program to advance the frontiers of knowledge in extra-high-voltage transmission and also to gain actual operating experience.

Dr. Pier A. Abetti, manager of systems research for G.E.'s Power Transformer Department, is in overall charge of the project. Julius H. Hagenguth is consultant.

"The entire electrical power industry will benefit from this project," Dr. Abetti said. "We hope to be able to solve in advance many of the problems that could impede the progress of utilities in this field. The next higher step from the present 345-kv transmission will be in the order of 460 kv, which we should have operating in America in the next few years.

"Project EHV will help speed the coming of more reliable and more economical systems for transmitting large blocks of power over smaller rights-of-way. It will serve the industry and the public by



I dreamed I paid $1,000 for a cutout!

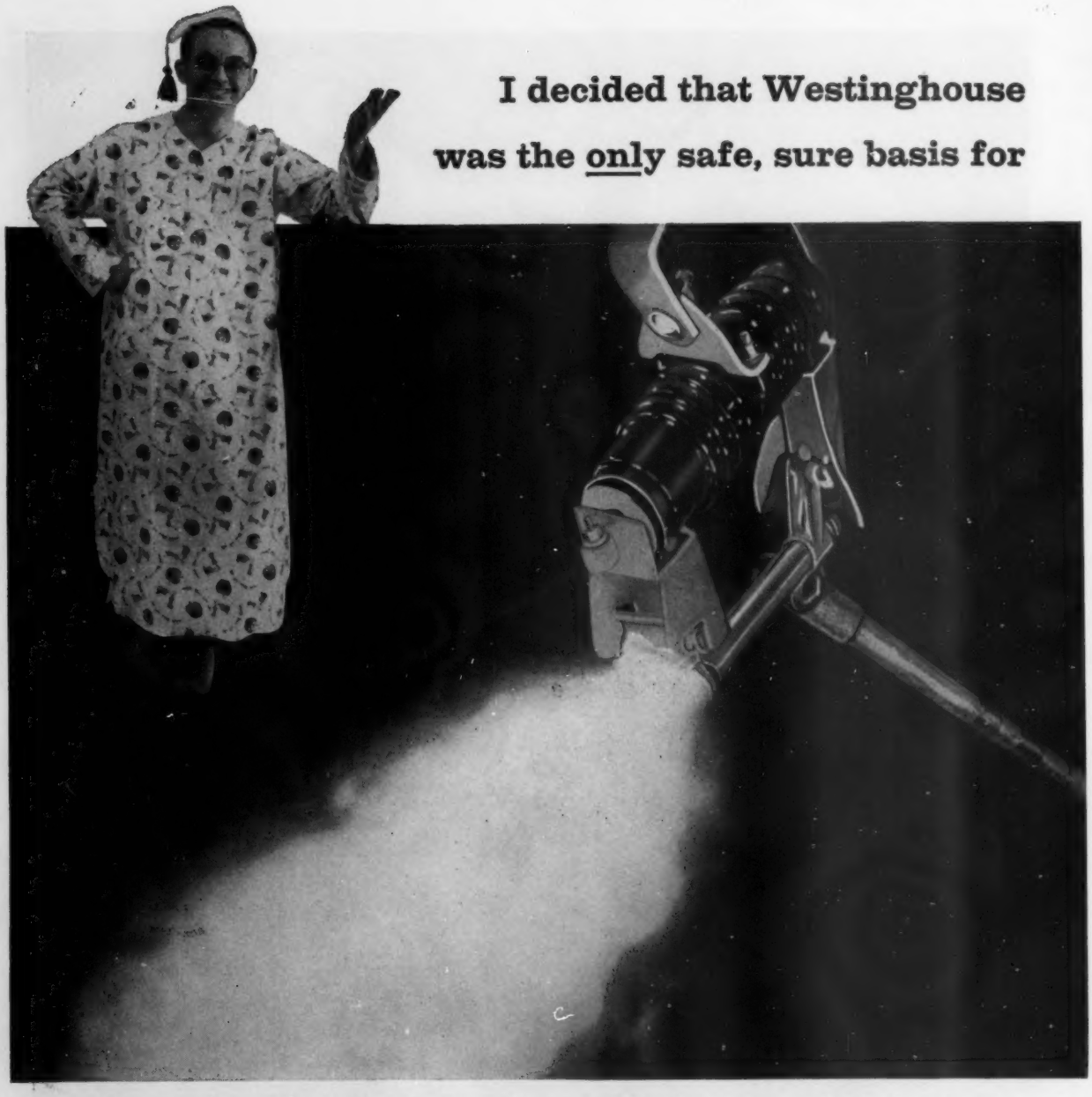
I woke up the other night in a cold sweat. This dream was as real as life . . . *a thousand bucks for a fuse cutout* . . . wow, what a nightmare!

But . . . then I realized that if the cutouts I bought didn't give me the *protection* I thought I was buying (even though their initial cost was pretty small) . . . the "real cost" of a single cutout *could be* as much as $1,000. If a sectionalizing cutout failed, the "real cost"—the resulting damage—could easily reach this amount. A cutout failure could mean a major outage with loss of revenue and customer good-will, cost of an extra service trip to replace the cutout and perhaps even damage to expensive adjacent equipment.

I'm sure glad it was only a dream . . . but it made me stop and think about this problem. How did we *know* our fuse cutouts would really interrupt rated faults? *Was I really getting full value for my protection-investment?*

J-60948-1

Turn the page to learn how Westinghouse promises PA's a sound night's sleep



I decided that Westinghouse was the only safe, sure basis for

Their grueling development test procedure guarantees me full value for my protection-investment

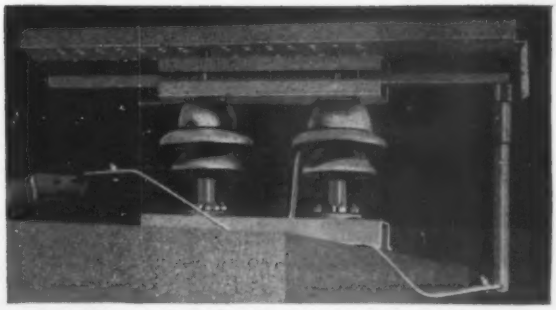
After my $1,000 cutout nightmare, I visited the Westinghouse High Power Lab to watch them testing their open-fuse cutouts. They have the toughest battery of tests I've ever seen. It really opened my eyes the way Westinghouse cutouts shrugged off those punishing shocks from high-current interruptions. The DX cutout cleanly interrupted all faults from minimum melting of the fuse link right up to the maximum interrupting rating of the cutout . . . and then the same fuse tube cleared currents even 150% above their maximum rating without a single tube failure or flashover.

Watching the wallop some of these high-current interruptions gave the cutout really put across the importance of rugged components such as hinges, clamps, brackets and porcelain insulators. I never dreamed (no pun intended) a manufacturer spent so much money in testing and developing a product that's so inexpensive we'd come to regard it as just another piece of hardware. In the Westinghouse High Power Laboratory and High Voltage Labs, I witnessed an exhaustive series of tests: interrupting, temperature rise, radio interference, impulse tests, wet and dry withstand tests, vibration tests . . . and even severe packaging tests.

And when the design engineer was confident enough to walk up to the DX cutout and casually close in on a fault of 100% of its interrupting rating (as shown in the Lab above), I knew I was getting all the protection we were paying for . . . and a whole lot more . . . when we bought Westinghouse fuse cutouts. J-60948-2

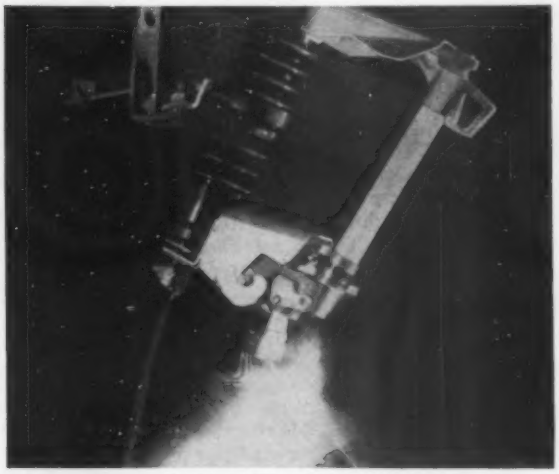
complete electrical testing

selecting a cutout!



Here's how Westinghouse **PLOWBACK** of earnings into research insures full value for your protection-investment!

Anyone can set up a test on a cutout. All it takes is a fairly large transformer, a breaker and a cutout. But, to start with fundamental research on the rocket action of the basic fuse tube of various materials, sizes and lengths and follow-through to the final verification tests on the complete product . . . testing each part that is subject to the shock of interruption . . . takes engineering know-how, time and test facilities . . . found only in the Westinghouse High Power Laboratory. This time-consuming but sure method of development costs money . . . lots of it, but really sure protection comes only from thorough electrical testing as was used in the development of the Westinghouse DX cutout and not from a design based on theory alone.



Completely safe load breaks

Load break interruption at full rated capacity proved the complete safety of this device for manual sectionalizing of distribution lines and capacitor switching. Arc is extinguished inside rugged Micarta® tube . . . with no arcing at contacts. This Westinghouse load break device provides a safe, easy and economical circuit interrupting device.

For full details about the "plus values" in Westinghouse DX open-fuse cutouts, call your Westinghouse sales engineer or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-60948-3

YOU CAN BE SURE...IF IT'S **Westinghouse**

contributing vital technical knowledge necessary to advance the expansion of low-cost electric power."

In America, Dr. Abetti explained, abundant fuel fairly close to industrial and population centers has provided the greatest per capita power consumption in the world at low cost. In Europe, however, where fuel is scarce and water-power sites are often far from population centers, there has been greater economic incentive to use higher voltages than there is in the United States.

"The time is soon coming, however, when we will find extra high voltage necessary. Eventually the nation will have a coast-to-coast power grid — a firm network of transmission lines which will interconnect all major power generating and consuming areas of the country. Such a transcontinental grid can be achieved only with super voltages," he said.

Component design underway

The project time table calls for detailed plans to be completed this year, including design of power transformers, switchgear, and other electrical equipment of higher voltage ratings than have ever been built before.

Construction of the towers will begin in the spring of 1959. By fall, one end of the line will be connected to Pittsfield-to-Lee, 115-kv circuit of Western Massachusetts Electric Company.

The line will be energized in early 1960 as an open-end line carrying charging current only, for tests of corona losses, mechanical performance, radio noise interference, etc., at various voltages in the 460 to 500-kv range.

Later that year and early in 1961, the conductor spacing will be varied and the voltage raised to the 600- to 750-kv range.

By mid-year of 1961, substation equipment at the other end of the line will be installed and connected to another point of the utility's Pittsfield-Lee line. The EHV line will then be operated as a part of that system and will carry loads up to 40,000 kilovolt amperes, more than enough electrical power to supply the City of Pittsfield, at voltages in the 600- to 750-kv range.

In 1962 the EHV line will take over the load-carrying job on a continuous basis, by-passing part of the existing 115-kv line, with G.E. turning over the operating

(Continued on page 108)

Bushing used in Project EHV will attain voltages higher than ever used by man for transmission of electric power. This bushing for a 650 kv transformer is being checked by technician in bosun's chair before it is lowered into oil tank for testing.

Model towers of GE's extra high voltage line, which will carry power at a maximum of 750,000 volts, dwarf the 110,000 volt transmission line tower built to the same scale, shown in foreground above.

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You get the $3.95 tool FREE of any extra charges in every HYLUG KIT #11. It cuts bolts, crimps on HYLUGS, cuts and strips wire — and fits your hand the way a tool should. You also get 250 HYLUG terminals in three Flip-Top boxes . . . sizes 18, 14 and 10. Do the job the modern way . . . flip out the HYLUGS you need as easily as reaching for a cigaret. See for yourself . . . call your local Burndy distributor and tell him you want to see the Kit. You'll breeze thru your next wiring job with Flip-Top HYLUGS and the Burndy HYTOOL.

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HYLUGS in Flip-Top boxes come in 29 popular sizes.

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Transformer fault protection

Part 3

By J. L. Blackburn

Relay Department
Westinghouse Electric Corp.
Newark, N. J.

◆ *This concludes the discussion on this subject which began in the April issue of Electrical South.*

Using overcurrent relays

As previously covered, differential relaying without a restraint type relay is not recommended. However, differentially connected overcurrent relays are in use and their application involves compromises.

One large western utility applies type CO-9 very inverse relays, 2-6 ampere range with 10-40 ampere instantaneous trip attachment for transformer protection universally with no restrictions. The CO unit is usually set at 40% of rated current with a time dial setting of 0.5. The instantaneous unit setting is between 200% to 300% of rated current.

On installation, inrush checks are made to assure non-operation of both units by energizing the bank some 8 to 10 times. Experience on this particular system has indicated that the CO unit seldom requires more than a 40% setting although the time dial sometimes must be around to as high as dial 1. Setting of the instantaneous unit is more critical with an average setting of around 250% of rated current. Experience has also indicated that if the relay will not operate on inrush, it will not operate on through or external faults.

The compromises with this protection are more field checking to determine settings and somewhat longer tripping times. While the overcurrent relay cost may be 50% or less of the differential relay cost, three-phase current balancing auxiliary transformers usually will be required. This cost plus increased installation cost probably will eliminate any cost advantages.

Regulating transformers

The regulating transformer with a shunt-exciting winding for voltage and/or phase-angle control, presents a special problem in the protection of the shunt winding. Its kva rating is only 10 per cent of the series winding; hence, its impedance is high. The high capacity series winding dictates a high ratio for the differential relays such that the relay sensitivity for faults in series winding is very limited.

In other words, the CA relay of Fig. 11 cannot detect medium to light faults in the series winding or in the tap-changing equipment where faults are most likely to develop. Recognizing this, the type CAM percentage-differential relay was developed to supplement the conventional differential relays. The relay has one operating and one restraint winding and has a 15% percentage characteristic. The

(Continued on page 110)

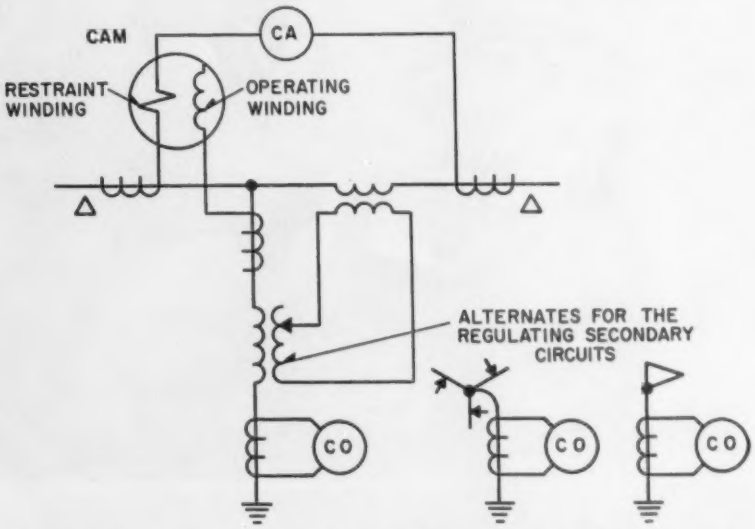


Fig. 11—Application of CA relay to differential protection scheme for regulating transformer. An overcurrent relay is applied in the grounded exciting winding and set selectively so that external ground faults do not operate before proper ground relays clear the fault.

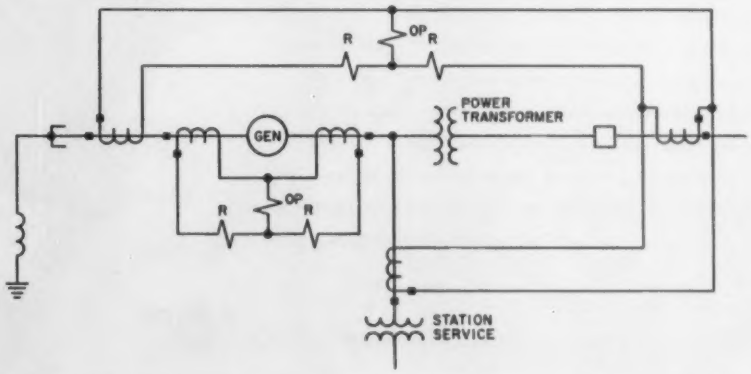
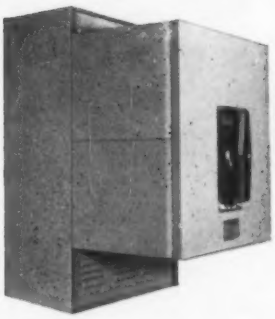


Fig. 12—In the unit type system the transformer differential relay often is connected to include the generator as well as transformer.



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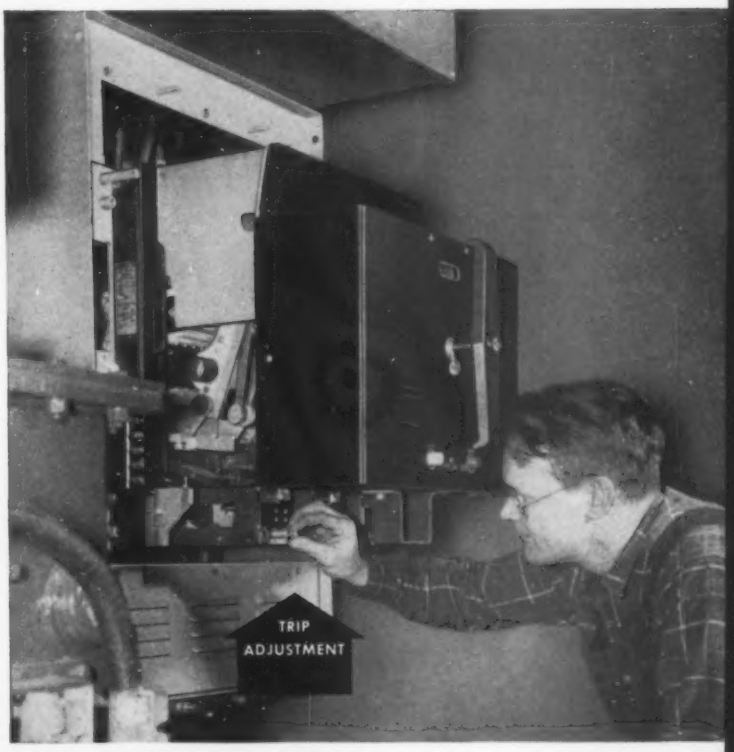

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The deep cover is the *not-so-deep* secret of safe, easy adjustment and inspection of Allis-Chalmers individually enclosed low voltage breakers. The entire breaker can be inspected without removing it from its position.

For the complete story on why Allis-Chalmers breakers are easy to use, as well as easy to install and maintain, call a local Allis-Chalmers distributor or office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

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1958 Protective relaying conference

◆ A PRACTICAL PROGRAM extending over a two-day period attracted more than 150 utility engineers to the 1958 Protective Relaying Conference sponsored jointly by the American Institute of Electrical Engineers and the Georgia Institute of Technology, in Atlanta.

The conference was presented by Georgia Tech's Engineering Experiment Station and the School of Electrical Engineering, in cooperation with the Engineering Extension Division. Arrangements for the conference were under the direction of Richard Wiegand, director of short courses and conferences.

Presiding over the opening session was B. J. Dasher, director of Georgia Tech's School of Electrical Engineering, who introduced Dr. E. D. Harrison, president of Georgia Tech, for his welcoming address.

Presiding over the other three sessions were R. W. Winfree, of Georgia Power Co.; Charles Dusenbury, Westinghouse Electric Corp.; and Jerry Vandegrift, Alabama Power Co.

Frontiers of relaying

Recognizing the tremendous growth that will undoubtedly take place in the electric utility industry in the next 10 to 15 years, M. S. Merritt of the Tennessee Valley Authority discussed the changes which such growth prospects would have on electric utility systems and their relay protection problems.

Among the load conditions and their effects which the industry can expect in the next 10 to 15 years are these, Mr. Merritt said:

More and more heavily loaded distribution circuits through areas with greater load densities and greater population densities. These circuits will have higher values of maximum fault currents, with minimum values substantially unchanged.

Increasing number of subtransmission lines, with heavier conductors, carrying much greater loads to more and larger distribution substations. The residential areas will crowd around these circuits to the extent that faults will jeopardize lives and property to a much greater extent. These lines will become primary distribution circuits.

Tendency of present primary transmission systems to become subtransmission systems if the voltage is less than 200 kv. The load on these will increase, and they must withstand severe surges and loading upon the loss of supertransmission lines.

Increasing use of double-circuit lines in the voltage classes now generally used in subtransmission and primary transmission systems.

Higher transmission voltages for primary transmission. Levels and time schedules have been publicly forecast as 460 kv by 1962 and 620 to 650 kv by 1970-75. Such circuits will be capable of carrying 1,000 megawatts of load under normal conditions.

Much larger generators and corresponding transformers. The forecast is for generators of 600-mw capability by 1964 or 1965 and 1,000-mw capability in about 10 years.

As a result of these important

A special panel discussion on "Relaying under abnormal system connections" was one of the features of the AIEE-Georgia Tech Protective Relaying Conference. Participating in the presentation were, left to right, Jerry Vandergrift, Alabama Power Co.; T. B. Chapman, Memphis Light Div.; A. L. Lipson, Virginia Electric and Power; C. C. Jones, Alabama Power Co.; W. E. Coe, Florida Power and Light; Henry Markel, New Orleans Public Service (substitute for A. J. Bartlett); and W. N. Taylor, Duke Power.

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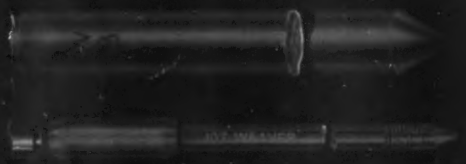

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changes in the electric systems of 10 or 15 years hence, Mr. Merritt continued, the relaying systems of that period will probably require: (1) More accurate discrimination between load conditions and circuit abnormalities which require that lines or other equipment be de-energized. (2) Improvement of the present good record of reliable tripping for faults and security against unwanted or false tripping. (3) Clearing of faulted lines and other equipment in a shorter time. (4) The fastest possible automatic reenergizing of equipment consistent with security against reclosing into circuits or equipment before deionization of the arc path or into a permanent fault.

Mr. Merritt then presented a comprehensive discussion of how the relaying problems of the future from generator to distribution system might be solved.

The opening session was concluded with a talk by M. M. Gilbert, of E. I. duPont de Nemours & Co., discussing the importance of cooperation between utilities and industries for optimum service continuity.

Versatile test set

J. C. Causey, test engineer for Georgia Power Company, then described a relay test set which his company had found particularly advantageous. The test set provides a source of test current, a variable voltage, and a means for measuring the relay operating time.

"We feel that this test set has fulfilled the requirements which we considered necessary for testing relays on the Georgia Power Company system," Mr. Causey reported. "The test set is portable and easily and quickly set up for testing relays because everything is contained in one unit. It is simple to operate since one four conductor cable and one power supply cord are the only external connections necessary for testing overcurrent relays. The time required to test relays has been reduced by 50% compared to our previous methods. The well-marked and inclined top panel makes visibility excellent. It is versatile because many types of relays may be tested. It is a source of test current and test voltage; and the timing unit may be used for various timing functions.

"Another point worthy of consideration is the relatively low cost. The entire unit including the carrying case contains $400 worth of materials. The test sets are built in our laboratory by new relay men who gain valuable experience for future test work. Approximately ten working days are required by one man to build a unit."

Relaying adequacy

The evaluation of distribution system relaying methods was the subject of a paper presented by D. B. Brandt for A. J. McConnell, both of General Electric Co.

"In spite of the growth of transmission and subtransmission, distribution still claims about 50% of the capital investment of a power system," Mr. Brandt said. "Furthermore, a large percentage of a utility's income comes from the numerous small loads on the distribution system, and there is undoubtedly a close relationship between income and service reliability. A major factor with respect to service reliability is protective relaying. It seems to be appropriate, therefore, to evaluate the present methods used in distribution relaying."

Mr. Brandt then reviewed the problems involved in distribution relaying, the performance specifications, coordination of relays with fuses, reclosers, and expulsion-type arresters, high-speed tripping and reclosing, feeders with multiple supply, back-up protection, etc.

In conclusion, Mr. Brandt said: "It has been shown that there is room for considerable improvement of present distribution relaying methods and equipment. With respect to most distribution feeders, the relay protection is now quite adequate. However, considering particularly the future, the protection afforded is rather poor. There are even now too many line burndowns (with the breakers involved as well as the relays), the relays are too insensitive during ground faults, they have too much overtravel, they reset too slowly, they require too much added time delay when coordinating with expulsion-type arresters, they have limitations with respect to cold-load pickup, and back-up protection is poor. Substantial improvements are possible in all of these areas, but generally not without increased cost."

He quoted other relay authorities to the effect that the number one problem in the field of protective relaying today is that of providing adequate protection for ground faults on distribution circuits; and that there is need for a better apportionment of relaying study and effort in the field of distribution system relaying as compared with transmission system and rotating equipment protection.

Testing K-Dar Relays

Field testing of "K-Dar" relays was the subject of a paper presented jointly by H. J. Calhoun and W. L. Hinman, both of Westinghouse Electric Corp. Their remarks were summarized in a conclusion as follows:

"The K-Dar family of relays consists, in part, of single-zone 3-phase distance-measuring relays known as types KD and KD-1 compensator distance relay and type KS out-of-step blocking relay. All three of these relays have similar impedance-measuring circuits and all three, therefore, can be tested and calibrated by the same methods and facilities.

"Complete laboratory testing can be accomplished quickly and simply with the usual test equipment that is normally applied in testing single-phase impedance relays. The electrical quantities required by the relays for laboratory testing are an adjustable 3-phase voltage and an adjustable single-phase current.

"Calibration of the relays is accomplished by balancing the impedance angles of the potential circuits with an adjustable core and reactor, or adjustable resistors. The procedure is simple and can be completed quickly. The maximum torque angle, θ, can be set by energizing the current circuit with a constant value of current and adjusting a resistor so that the compensator induced secondary voltage has a value which is a function of the sine of the angle θ.

"A portable test unit will soon be available which operates from a single-phase source and provides a 3-phase test voltage at the relay terminals. This portable unit will be compact, comparatively light weight, and provide for nearly as complete testing as does the normal laboratory test facilities.

"Switchboard wiring can be quickly verified by the use of various switching arrangements on the relays. In the event that the switchboard wiring is in error, the current and its polarity in each of the current circuits can be identified as an aid in correcting the error."

Computer applications

The second session of the conference was concluded with a discussion of the application of digital

(Continued on page 106)

Mr. W. H. Brown, right, reviews plans with Kuhlman salesman, Andrew H. Baxter.

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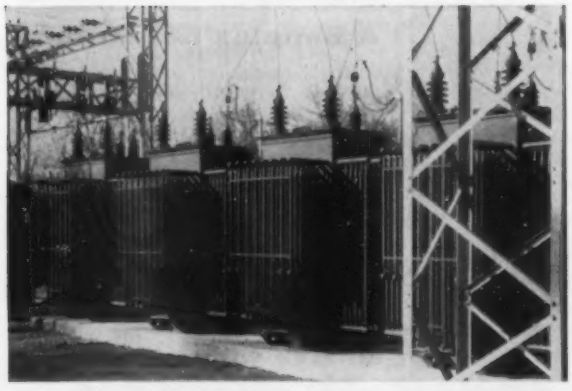

Doswell, Virginia looks ahead. When planning this four Kuhlman power transformer substation, approximately 50% reserve capacity was allowed for future growth.

"We particularly like the design of Kuhlman transformers," says W. H. Brown, Manager of the above installation at Doswell, Virginia.

"They are rugged in construction and generously provide all the features we consider important.

"We are also impressed with their height, which solves our problem of maintaining required ground clearances.

"Then, too, delivery was according to schedule which, in itself, is no little consideration."

This installation of three Kuhlman single phase power transformers, plus a spare, serves the growing rural and small industrial community of Doswell, Virginia. Although some of the load is polyphase, single phase units are used rather than three phase to give greater versatility for serving the system's single phase farm and residential lines.

Like Mr. Brown, you'll find Kuhlman small power transformers meet all your requirements —especially those features important to you.

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Right off the Wire

An application of television shows a pilot the image of his plane superimposed on a map of the territory over which he is flying.

An X-ray inspection method for solid cast rocket fuels reveals any cavities or fissures that would interfere with burning.

A new machine at Simplex applies Condex Interlocked Armor over cable cores having diameters up to 4.5".

An electronic guidance system will help river pilots to maneuver long strings of barges around the bends and under the bridges of the Mississippi.

A new facility for advanced research in thermonuclear reactions is expected to generate temperatures in the millions of degrees.

A land-mine exploder has been developed by the Army which will detonate buried explosives without damage to the exploder or the tank that carries it.

A new alkaline flashlight battery is said to last ten times as long as ordinary dry cells and to deliver more power.

A generator-powered flash-bulb holder is about the size of an electric razor. Half a turn of a wheel stores enough electricity in a capacitor to fire the bulb.

A television tube only five inches thick has been developed in England.

A process has been developed for electroplating copper on aluminum. The plating can be tinned, soldered or formed.

A new synthetic rubber is resistant to oils, fuels and solvents and retains its properties at temperatures as high as 400°F.

A new chemical compound slows the growth of any part of a tree without affecting the rest.

A new electronic instrument analyzes the sequence of chemical reactions in the burning of rocket fuels in one ten-thousandth of a second.

A single relay system across Canada from Halifax to Victoria will carry television programs and telephone conversations.

The floodlights at Niagara Falls have been redesigned to give ten times the illumination of the former twenty-five-year-old system with no increase in power consumption.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

Among the United States exhibits at Brussels will be an outline of world history for the entire Christian era stored in a computer. Any item can be found in two-thirds of a second and printed in any one of ten languages.

The first digital computer fast enough to evaluate the performance of a missile in flight is said to be twenty-four times faster than preceding models.

A new X-ray technique reduces radiation exposure to a fraction of that now used for diagnosis.

A new truck transmission has twelve speeds in one gear box controlled by one lever.

A new machine can weigh and sort coins at the rate of 18,000 per hour with an accuracy of plus or minus one-fourth of one per cent.

A new desk-top machine covers one or both sides of documents with clear plastic film.

A device for practice in marksmanship shoots, instead of a bullet, a flash of light, which shows on the target.

An ultra-sensitive space speedometer measures acceleration in any direction.

A Simplex Laboratory

At the Simplex plant in Cambridge, six modern, well-equipped laboratories similar to the one shown here are devoted to the never-ending search for new, better materials and methods which result in new, better wire and cable products. Over the years, this program of concentrated, intensive research has brought about a great number of the most important technical advances and product improvements that have made Simplex the leader in the wire and cable industry.

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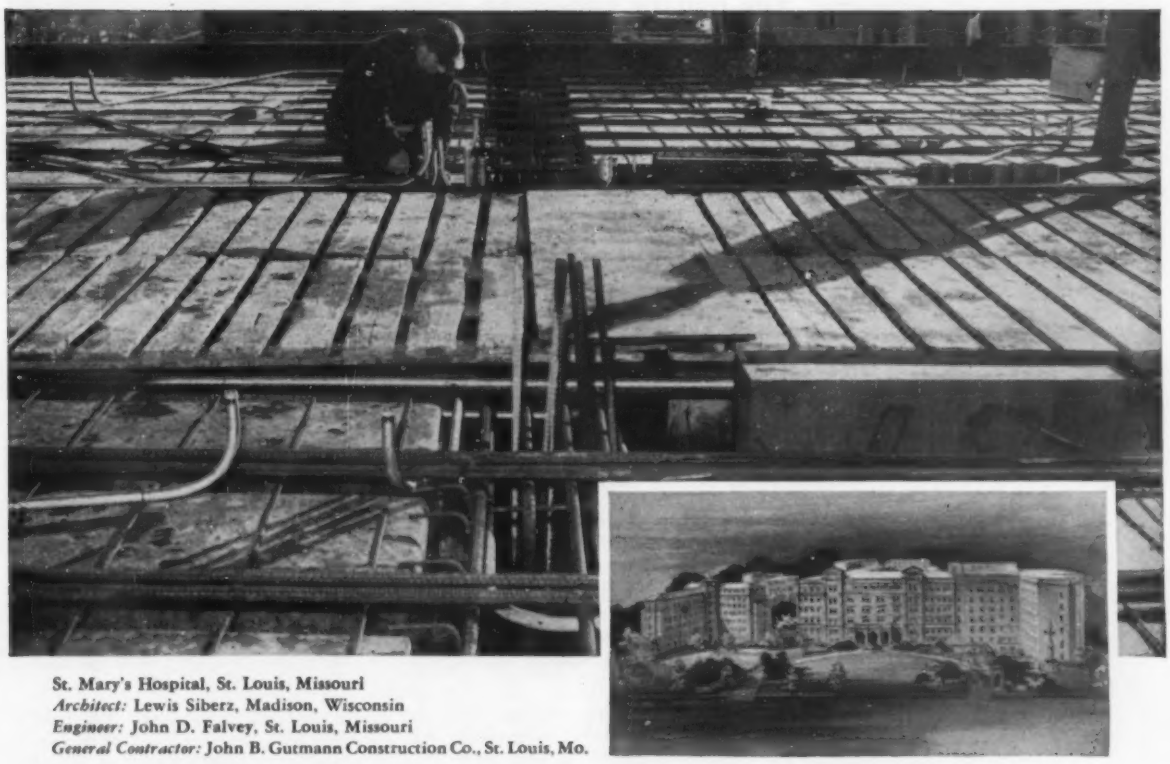

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STEEL AND TUBES DIVISION
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I would like to learn more about Republic ELECTRUNITE E.M.T. features and installation advantages.

Name_____ Title_____

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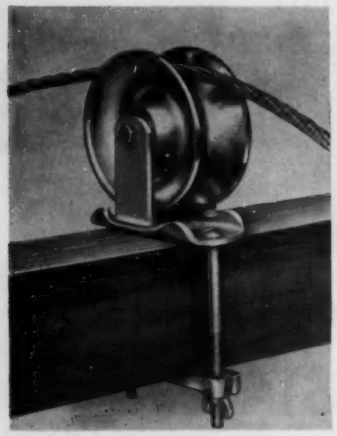
Notes on new utility equipment

Sturdy stringing block mounts on roofed or flat crossarms

AN ECONOMICAL crossarm stringing block for straight pulls has been developed by Sherman and Reilly, Inc., 100 W. First St., Chattanooga 2, Tenn., identified as their Model XS-505. This sturdy string block is designed for quick, easy mounting on roofed or flat crossarms. Requires no special tools. Has no loose pieces to lose in the field.

Carefully engineered for maximum strength, minimum weight. Sheave is tough aluminum alloy, 7" OD x 3"



wide accommodates cables through 1¾" diameter. Equipped with anti-friction bearings. Fits all crossarms through 5" x 6" size.

For additional data, ask for item U-701, using the coupon on page 113.

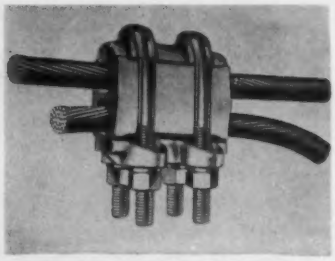
Parallel clamp connects ACSR, copper and aluminum

ENGINEERED for dependability in feeder, transmission, and primary distribution connections, a new heavy duty all aluminum parallel groove clamp has been introduced by Burndy Corp., Norwalk, Conn., for aluminum, copper, and ACSR. Only three connector sizes cover the range from 3/0 through 954 MCM.

Massive design and a large spacer protect against galvanic action. Generous contact area and sustained contact pressure make low-resistance connectors that can carry heavy overloads.

Special aluminum U bolts and tapered bell mouths minimize cold flow and eliminate cable chafing. A modified V groove produces wiping action on the cable and assures good electrical performance over the full range of the connector.

Overlapping spacer tabs keep cable



strands from splaying. U bolts are captured so they can't get lost, heat treated to take intense clamping forces. Contact surfaces are cleaned at the factory and coated to prevent formation of oxide film.

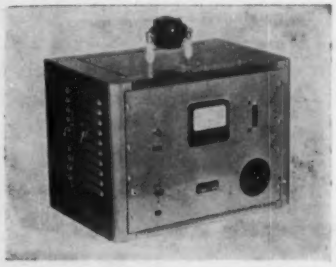
For additional data, ask for item U-702, using the coupon on page 113.

High voltage instrument tests insulating liquids

HIGH VOLTAGE tester, Model 4505 HYPOT, for testing breakdown of all insulating liquids is announced by Associated Research, Inc., 3777 W. Belmont Ave., Chicago 18, Ill., manufacturer of high voltage testing instruments.

This new HYPOT is designed to test liquids such as transformer oil to meet ASTM and Federal specifications. This oil tester is of value to production and maintenance engineers working with high voltage equipment employing insulating oils such as transformers, HV capacitors and bushings, or oil immersed components or power supplies.

The features incorporated into this instrument include: ample voltage range, 0-35 kv a-c; 2 kva capacity rating to meet ASTM and Federal Specifications; continuously variable



test voltage control; and accurate test voltage metering directly across the electrodes.

In addition to these features, Model 4505 is also available with built-in, motor driven, automatic rate of rise control to increase test voltage at 3 kv/sec, as required by ASTM specs.

For additional data, ask for item U-703, using the coupon on page 113.

Power regulator panels test band width and voltage level

ALL POWER REGULATOR control panels now offered by Allis-Chalmers Manufacturing Co., 938 South 70th St., Milwaukee 1, Wis., are being equipped with a new device for set-

ting and testing band width and voltage level without disturbing the output voltage of the regulator.

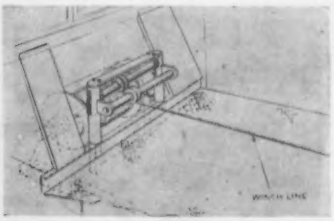
This new device enables operators to set and test band width and voltage levels in a fraction of the time formerly required. It consists of a variable resistor in series with a capacitor that can be switched into the control circuits to raise or lower control voltage to test upper and lower band widths and voltage level.

With the device, line drop compensator settings do not have to be set to zero when setting or testing is going on as previously required. Accurate settings are quickly accomplished with this new device.

For additional data, ask for item U-704, using the coupon on page 113.

Level winder lays winch cable neatly

A LEVEL WINDER that lays winch cable on a drum neatly, even under extreme load conditions, is being



manufactured by J. H. Holan Corp., 4100 West 150th St., Cleveland 11, Ohio.

The Holan level winder has a unique 3-spring arrangement in the

Here's how contractors net:

top profits per job with new Murray "MP" breakers

Finest protection possible... at competitive prices

- Superior branch circuit protection
- Carries full rated load
- No nuisance tripping • No waiting to reset
- Only two switch positions
- Tungsten silver alloy contacts
- Sturdy plug-in design • Safety trip-free handle
- Backed by full line of "MP" load centers

Jobs go up faster, easier with minimum wiring runs — and no nuisance callbacks afterwards

How come? Because "MP" breakers are fully magnetic and contain absolutely no limiting thermal element. They work strictly on current alone — not heat.

Think of the profit advantages for you! Now you can put up load centers *anywhere* — near steam risers, oil burners, even in kitchens over stoves — *wherever it's most practical for quick, easy wiring with minimum runs.*

That's not all! Fully magnetic breakers have always provided superior branch circuit protection without nuisance tripping. Advantages to you: no unnecessary callbacks, satisfied customers, repeat business — and finally, additional profits.

Best of all, "MP" breakers — backed by a full line of plug-in "MP" load centers — cost no more than ordinary breakers.

So next time you order circuit breakers, ask for new fully magnetic "MP's" — and see what a difference it makes in your operations. Available now at your Murray wholesaler's.

For more information about "MP" breakers, mail coupon today!

Murray

Murray Manufacturing Corp., 1250 Atlantic Avenue, Brooklyn 16, N.Y. Dept. ES 2

Please rush me: ☐ full information on new "MP" line ☐ new 1958 Murray Catalog.

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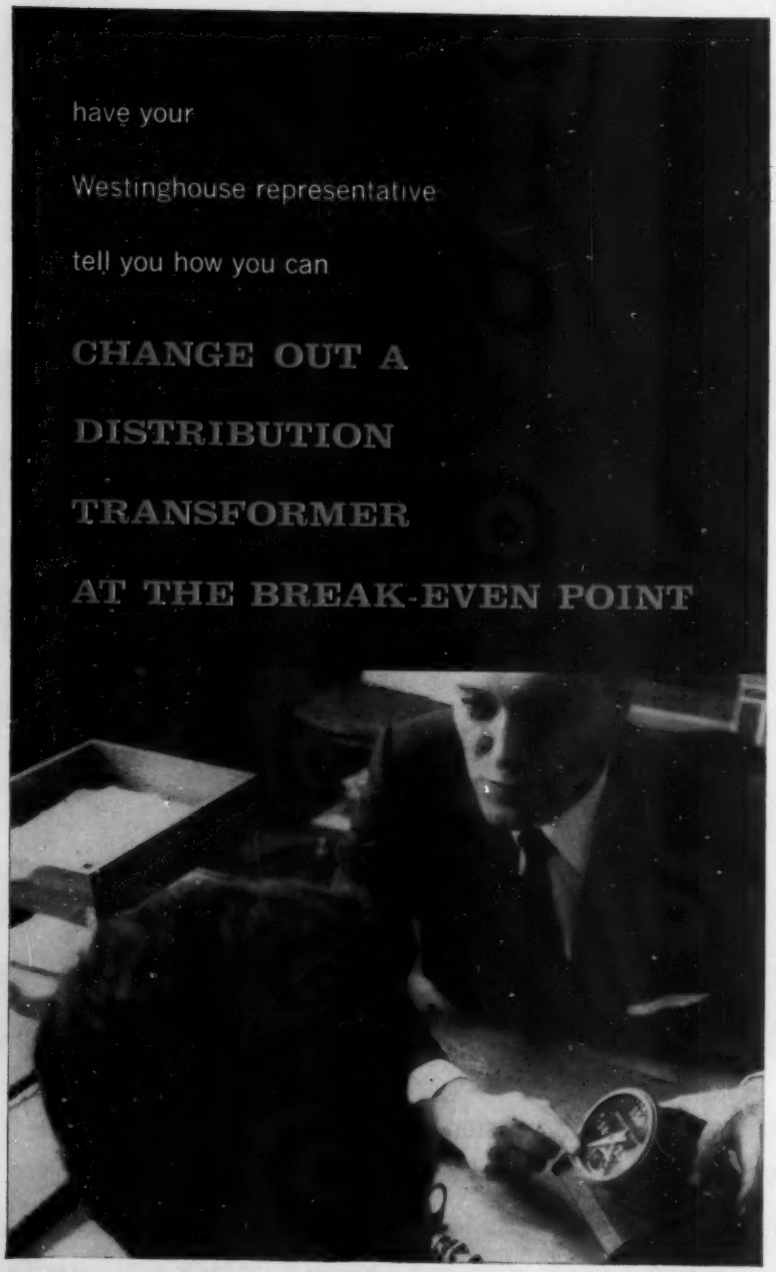
Type of business .....



Now—an indication to show when the loading on a pole-type distribution transformer has reached economical change-out point on conventional or protected units . . . Another answer to meet a changing need—made possible because Plowback of earnings into research maintains Westinghouse leadership in distribution transformer development.

J-70847

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two posts that support the rocker bar of the winder. The result is even, no-kink winding whether the cable has only a slight amount of tension or is subject to a horizontal pull equal to the capacity of the winch itself.

Holan cites the following benefits to be derived from the use of its level winder: safe operation, longer cable life and lower maintenance costs.

Made specifically for 20,000-pound Holan Series HB9 winches, the new level winder can be adapted to other units. Field installations can be made in a few hours and with a minimum of work required for alterations. Winch lines employing the Holan level winder are threaded through a sheave either at the back of the truck or on a derrick head.

For additional data, ask for item U-705, using the coupon on page 113.

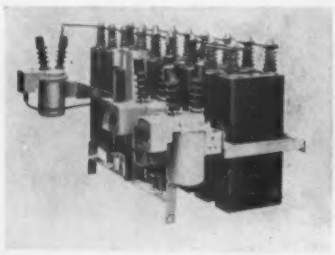
Structural aluminum frame for pole top eqdipments

STRUCTURAL aluminum has replaced galvanized steel as the frame material for 60 and 75 kv BIL fixed and switched, single-row pole-top equipments with 50-KVAR capacitors manufactured by the General Electric Co., of Schenectady 5, N. Y.

Since both aluminum and the capacitors resist corrosion, these equipments should require no protective paint maintenance, even in industrial or coastal areas. No protective touch-up is necessary if the self-protecting aluminum alloy frame is drilled or tapped in the field to add accessories.

Weight of these pole-top equipments, which is at least 10 percent less than that of equivalent equipment with galvanized steel racks, makes them easier to install.

A new direct-to-pole mounting design provides rigid, two-point contact at both the upper and lower securing points of the equipment, even if the pole has an irregular surface. In addition, the bearing surface of the front-of-pole brace has been increased to provide an even stronger arrangement.



Four lifting eyes on the rack simplify hoisting the equipment with standard block and tackle.

The single-row pole-top equipments are available in ratings from 150 to 600 kilovars, 2.4 to 13.8 kv.

For additional data, ask for item U-706, using the coupon on page 113.

Phase sequence indicator can be carried in pocket

THE "TESCO" phase sequence indicator now available from Eastern Specialty Co., 3617 North 18th St., Philadelphia 40, Pa., is an instrument

that can be carried in the pocket to determine phase sequence of polyphase circuits.

Electrical engineers, maintenance men, trouble shooters will quickly realize the special advantages of its portability and light weight. Compact, easy to use: The lead with the clip #2 is attached to one phase terminal. The insulated prod (#1) is then touched to the second phase terminal and the prod (#3) on the end of the instrument body is touched to the third phase wire; the positions of the two prods can be instantly interchanged to reverse the indication.

The body of the instrument is made of insulating material; measures 13/16" in diameter and 7 5/16" long over-all; weighs less than 3 ounces; packed individually in a tubular plastic container.

For additional data, ask for item U-707, using the coupon on page 113.

Pneumatic device lifts circuit breaker tanks

TO HELP the maintenance man raise and lower frame-mounted oil circuit breaker tanks (15 kv to 69 kv) in rapid time, a pneumatic tank lifter is now available from the Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

This time-saving device consists of two cylinders that are easily attached to the circuit breaker tanks, and a control valve that is attached to the horizontal member of the circuit breaker frame. The entire assembly is lightweight and installed with ease. Each cylinder weighs 20 pounds.

When raising a tank of oil, the operator merely pushes the valve to the right. Air pressure in the two lifting cylinders is equalized and assures level raising of the tank in about three minutes.

To lower the tank, the operator simply moves the valve handle to the left. Air is released until the lowering pressure of the tank is reached. The tank lowering operation is done in a little over one minute.

The oil circuit breaker tank rides evenly up and down, because the whole unit is self-leveling. For instance, if one cylinder tries to get ahead of the other, the center of gravity shifts allowing the other cylinder to catch up.

A single tank lifter can be used on all modern pneumatically operated frame mounted breakers. This new device is adaptable to the older Westinghouse frame mounted oil circuit breakers by minor field modifications.

The source of compressed air used by the tank lifter is the air receiver and compressor unit that is a part

of each pneumatic breaker operating mechanism. If it is desired to use the pneumatic tank lifter with solenoid operated breakers, a small portable air receiver and compressor can be supplied.

For additional data, ask for item U-708, using the coupon on page 113.

Connectors speed deadending and step-up tap connections

A NEW LINE of aluminum Squeezon compression connectors is now available from the James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo. They are designed primarily for easier and faster deadending and for making step-up tap connections where the tap wire is larger than the

line wire, as an ACSR tap from a copper line. These connectors are for use on all combinations of aluminum, ACSR and copper.

Now . . .
stop line outages
caused by birds
and squirrels . . .

NEW PLASTIC-COATED COVERS ON WESTINGHOUSE DISTRIBUTION TRANSFORMERS

Have your Westinghouse representative give you the full story about . . . another answer to a changing need.

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Both conductor grooves are open and the sides parallel. Either groove may be used for line or tap wire, and the tap taken off from either above or below the line. Having both grooves open eliminates inserting the tap wire into the connector endwise.

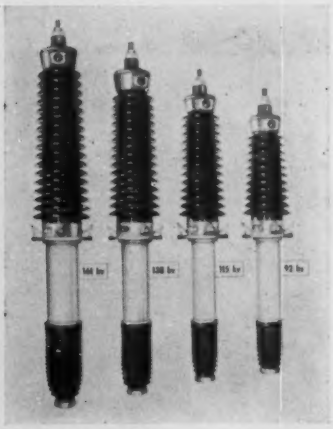
Fold-over tabs on the jaws keep the Squeezon in place until it is compressed. For deadends, the Squeezons are installed after the loop is formed. It is not necessary to thread the conductor through the connector. These connectors are installed with either Type 0 mechanical or WH-1 hydraulic tools.

Squeezon connectors are regularly furnished with Kearnalex inhibitor filled grooved and enclosed in a sealed plastic bag. This keeps the connector clean up to the moment of use, and assures contact aid being used on every connection.

For additional data, ask for item U-709, using the coupon on page 113.

Paper-oil condenser bushings for high-voltage applications

A NEW SERIES of POC (Paper-Oil Condenser) Bushings for high voltage transformer and circuit breaker ap-



plications is announced by the Lapp Insulator Co., Inc., Le Roy, New York.

The new bushings are designed in 92 kv, 115 kv, 138 kv, and 161 kv ratings and are a matching series to the lower voltage Lapp-POC Bushings, 15 kv-69 kv. Lapp condenser type bushings are now available in all popular voltage ratings 15 kv-161kv, in the same basic design, meeting ASA Standards.

The Lapp-POC Bushing is a completely sealed paper-oil-condenser type design with the condenser core entirely surrounded by oil and enclosed in a rugged porcelain-metal housing. There is no exposed core. The lower end of the core is covered with a non-tracking porcelain housing, (corrugated on the new 92 kv-161 kv bushings).

This porcelain protects the core from deterioration by sealing out contamination and moisture. Spring loaded gaskets seal the assembly and protect the bushing from leakage and moisture.

The new bushings are radio and television interference free at rated voltage and have a low power factor. All bushings 92 kv-161 kv have as standard equipment, oil level gauges on the side of the oil reservoir and a capacitance tap in the side of the mounting flange, that can be used for power factor measurement or as a voltage supply tap for connection of potential devices.

For additional data, ask for item U-710, using the coupon on page 113.

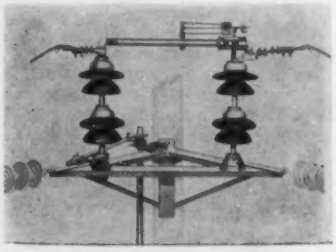
Group-operated air-brake switch for single circuits

THE A. B. CHANCE Co., 210 N. Allen St., Centralia Mo., is now making a one-way GOABS, a complete switch "package" for single-circuit switching of phase-over-phase lines. The one-way GOABS consists of a three-phase side-break switch, mounting frames for each phase, and complete control mechanism for mounting on a single pole. It is available in ratings of 34.5, 46, and 69 kv at 600 and 1200 amperes.

The right-angle frame design of the one-way GOABS makes it particularly suited for "corner" switch installations. Phase - over - phase switch arrangement provides free climbing and working space for easier installation and line maintenance.

The proven features of the Chance two-way and three-way GOABS are incorporated into the one-way design. Switches are of braidless, high-pressure, side-break design and are furnished with high-speed snap-out arcing horns for interrupting magnetizing or line-charging currents.

The open contacts are self-wiping, silver-to-copper with high-pressure provided by beryllium-copper springs

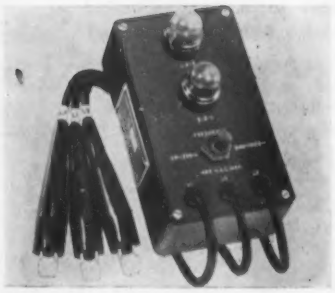


separate from the main current path Straight-through contact design provides a blade-gripping action when switches are subjected to fault currents.

For additional data, ask for item U-711, using the coupon on page 113.

Voltage peak order indicated on multiphase power supply

THE OPAD Electric Co., 69 Murray St., New York 7, N. Y., has introduced a new low cost phase sequence indicator for rapid determination of



the order in which the voltage peaks of a multiphase power supply occur.

The Model VA2 is a compact light weight instrument designed for direct connection, without switching, to polyphase circuits with voltages between 104 and 480 volts. The frequency range of the instrument is from 30 to 1000 cycles.

Oil tight panel components are employed for maximum reliability under adverse environmental conditions. Connections are made by means of three 36-inch oil resistant rubber covered test leads with insulated clips.

Leads are marked at both ends for positive identification and are securely anchored to the instrument with strain-relief fittings. The instrument is entirely self contained in a high resistance case 6¼ x 3¾ x 3¼. Weight is only 24 ounces.

For additional data, ask for item U-712, using the coupon on page 113.

Aluminum conductor designed for highly corrosive areas

ALL ALUMINUM alloy conductor, AAAC, is now being made available for general commercial use by Kaiser Aluminum & Chemical Sales, Inc., 919 North Michigan Ave., Chicago 11, Ill.

Designed for overhead distribution systems, AAAC has the strength and electrical properties of ACSR (aluminum Conductor Steel Reinforced), costs the same on a footage basis and yet offers many installation, upkeep, performance, and economic advantages.

The new solid or stranded Kaiser Aluminum conductor is available bare, covered or insulated in AWG sizes from #6 on up to virtually any circular mil size which customers might require. In addition to single AAAC conductor, multiplex cables are available. Several manufacturers are already offering complete lines of accessories.

Major applications for AAAC include urban primaries, secondaries, multiplex cable neutrals for duplex, triplex and quadruplex service drops, and municipal street lighting systems.

AAAC is a high strength, heat-treatable aluminum alloy with magnesium and silicon as the main alloying elements.

For additional data, ask for item U-713, using the coupon on page 113.

ELECTRICAL ENCLOSURES

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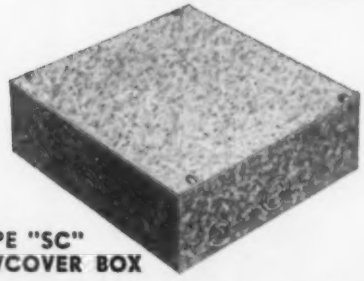
Contractors, Industrials, Utilities, Municipalities, REA's

CABINETS AND BOXES

TYPE "PF" TELEPHONE CABINET

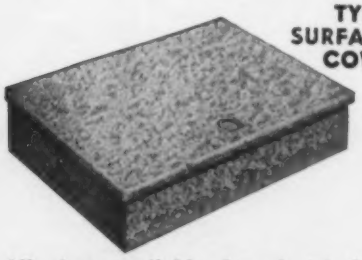
Surface or Flush Mountings in either galvanized or grey enamel finish. Constructed from the finest steels available, all in compliance with the Underwriters Laboratories specifications.



TYPE "SC" SCREWCOVER BOX

Durable Formed Construction, galvanized or grey enamel finish, with or without knockouts. Sizes to your specifications.

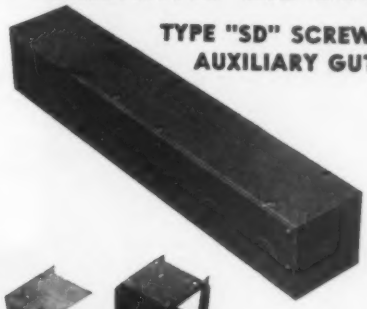
TYPE "A" SURFACE HINGE COVER BOX

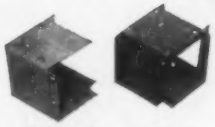


All sizes available for electrical cutouts, switches, relays, junction and pull box applications, galvanized or grey—with or without knockouts.

WIREWAYS and DUCT

TYPE "SD" SCREW COVER AUXILIARY GUTTERS





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END CAPS

For Switches, Panel Boards or Straight Runs, you can't match the flexibility, greater capacity and easy installation of B&C wireways. Die formed construction of heavy gauge sheet steel, as specified by the Underwriters Laboratories and the National Electrical Code.

HINGED COVER WIREWAYS

TYPE "HCW"
2½ x 2½, 4 x 4, 6 x 6
1 to 5 foot lengths

ALL ASSOCIATED FITTINGS AVAILABLE

Steel Protection of Electric Conductors, plus Accessibility.

Economical to install and maintain — tapping, splicing, additions, inspections, may all be made within the limitations of the National Electrical Code.

Your Seal of Dependability and Safety

Write for descriptive catalog containing installation data and current price list.

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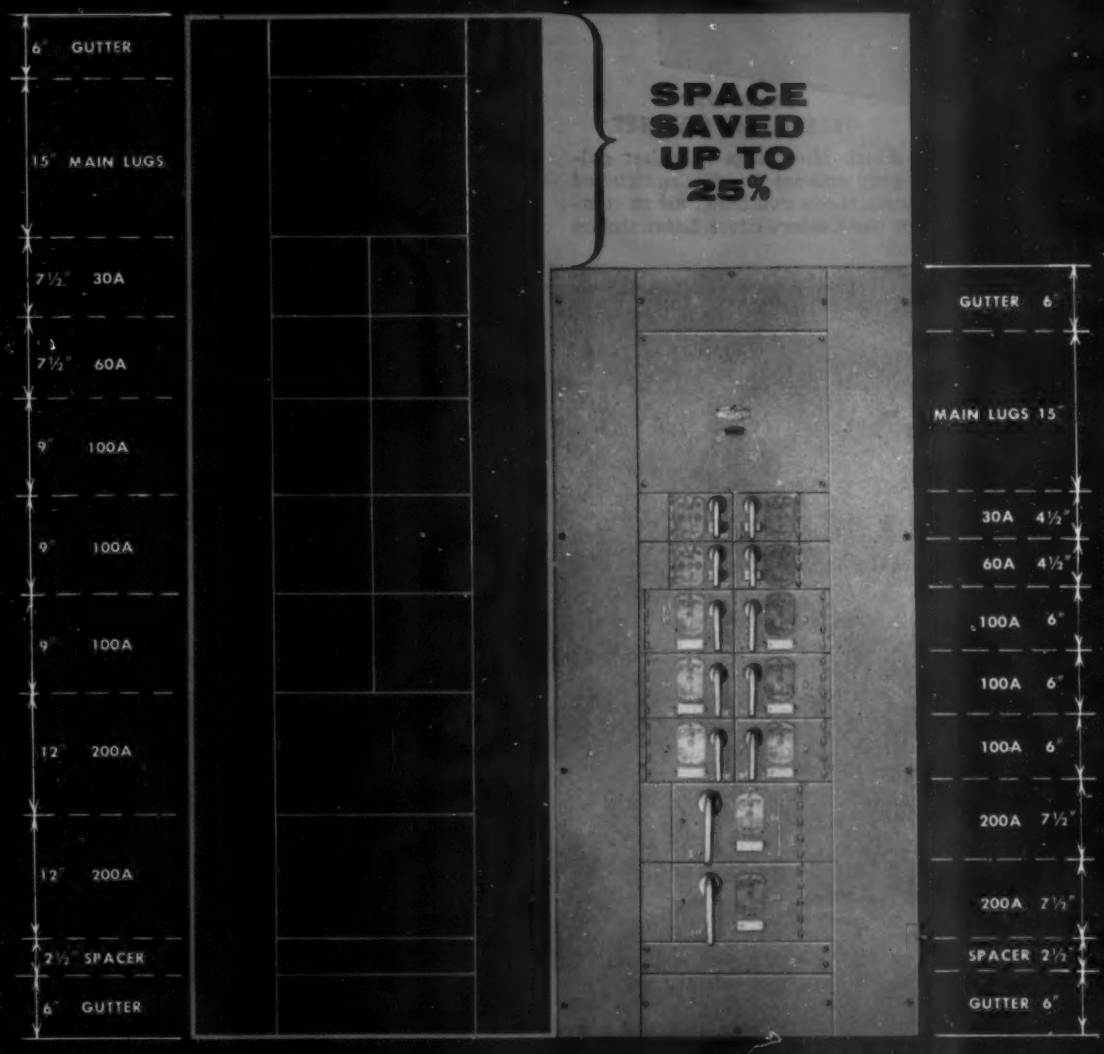

TYPICAL PANELBOARD WITH ORDINARY SWITCH UNITS

TYPICAL PANELBOARD WITH NEW S-A-W SWITCH UNITS

ADAM S-A-W SWITCHES TO 25% PANELBOARD SPACE!

Another engineering advance by Frank Adam! These smaller space-saving S-A-W Shutlbrak switches present several exclusive advantages:

- If mounting space is limited, fewer panelboards will be needed thus saving both installation labor and equipment cost
- Provision for future expansion can be made by the installation of normal size panelboard enclosure and the smaller S-A-W Switches with filler plates
- Allow the use of smaller panelboards in new installations

Capacities of the new S-A-W switches are the same as ordinary switches of larger size. A full range of ratings is available in a combination of single and twin units. Defeatable interlocked doors insure positive safety.

Construction is the same exceptional quality typical of all FA equipment.

Prompt delivery from stock!

Ask your well qualified FA Representative for his help on all your technical problems involving light and power control and distribution.

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S-A-W SHUTLBRAK SWITCH

Rotary operated, with famous arc-proof quick-make, quick-break mechanism. Continued use keeps the heavily silver-plated full-floating roller contact permanently clean and polished.

Know the law

by Arthur L. H. Street

Homeowner held "not liable" in workman's electrocution

◆ OF CONSIDERABLE importance to electrical contractors is a decision reached February 14, 1958, by the United States Circuit Court of Appeals, Fifth Circuit, in the Louisiana case of Southern Farm Bureau Casualty Insurance Co., appellant (defendant in a lower court) v. McKenzie, appellee (plaintiff in the lower court) 252 Fed 2d 195.

The case dealt with the liability of a home-owner for electrocution of a heating contractor's employee who came in contact with electric wiring in an attic. The wiring allegedly had been left in a dangerous condition by an electrical contractor.

Mrs. McKenzie, widow of the victim of the accident, sued defendant insurance company which had issued a liability policy to one Sibley, the home-owner. The United States District Court at Shreveport, Louisiana, ordered judgment in favor of the widow, but, on appeal, the Circuit Court of Appeals decided that the suit must be dismissed because the home-owner was not at fault and so, the insurance company was not liable.

Electrical splice exposed

Sibley, the home-owner, had hired a competent electrical contractor to change the lighting arrangement in the Sibley residence. In performing this contract and while working in the attic over a carport where the head clearance between the ceiling joists and the rafters was only three or four feet, the contractor or his workmen found it necessary to splice electrical wiring by joining two nonmetallic sheathed cables and then taping the joint with insulating tape.

After the cables were so joined, the splice came to rest on a ceiling joist and was there left exposed without being enclosed in a metal junction box. This was unknown to Sibley because he had no occasion to enter the attic or to observe the wiring conditions until after the accident. Several months after the wiring job was completed, Sibley engaged Radalec, Inc. to install a heating system and related metal duct work in his home.

Paul McKenzie, an experienced sheet metal worker employed by Radalec as a fourth year apprentice, together with his brother, a helper, was assigned to do this work. After first inspecting the attic to determine where to lay the metal ducts, they began installing them. For two days they worked together in the cramped quarters of the attic and nothing unusual happened.

On the third day James McKenzie, on Paul's instructions, left the attic to get certain additional materials. Upon returning, he found Paul lying unconscious with his left shoulder against a galvanized iron vent pipe and another portion of his body resting on the sheet metal duct work. Upon touching his brother's leg, James felt the e'ectrical shock. With the aid of his foot he pushed Paul's shoulder away from the vent pipe. Shortly thereafter Paul died without regaining consciousness.

The higher court reasoned:

"The owner of a building owes a duty to his invitees not to injure them through negligence in construction or maintenance of his building in an unsafe condition, but the test "of legal liability" in such cases is not what he could have done to prevent the injury and accident, but what a reasonably prudent and careful person would have done under the circumstances. * * * We * * * find no * * * evidence that Sibley had any knowledge of the splice in question or the manner in which the wiring was installed in his attic.

"On the contrary, the * * * testimony is to the effect that he did not know and, * * * had never seen the wiring. Having hired a competent contractor who enjoyed a good reputation in the community and was as 'good as any you can get' Sibley had every reason to believe that the wiring had been installed in a safe and workmanlike manner. * * * There was no showing that Sibley knew or in the exercise of ordinary care should have known of the allegedly defective splice."

Electrician's liability

It will be noted that the courts did not decide whether or not the electrical contractor was legally liable for the death of McKenzie, although it was intimated that it was careless not to enclose the wiring splice in a junction box. But it had been agreed that if the insurance company should be held liable for the accident, then there should be a trial as to whether it was entitled to be reimbursed by the electrical contractor. The decision that the insurance company was not liable avoided necessity for determining whether the contractor was liable.

The widow's lawyers probably thought that it would be easier and more profitable to sue the insurance company than to sue the electrical contractor. Having failed in that effort, it does not appear whether attempt is being made to collect damages from the contractor.

If such a suit were brought, it would seem that the contractor could not be held liable on mere proof of failure to enclose the wire splice in a junction box. Under fundamental rules of law, it would seem to be necessary also to prove that he was bound to foresee that, because of the location of the splice, some one would be apt to be electrocuted. It would be for a jury to say whether the contractor was liable.

In any event, the case seems to furnish a warning that, to be absolutely on the safe side, *no electrical wiring should be left in less safe condition than is assured by standard electrical engineering practice.*

Although, as in this case, the electrical contractor's contractual dealings are usually with the owner or occupant of a building, it is

(Continued on page 105)

Safest switches known

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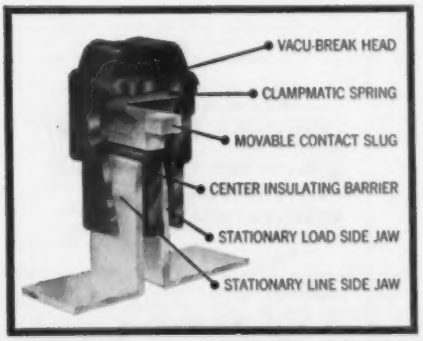
BullDog's "Big Three" safety switches, the "Master", "Junior" and "Rain-tight", assure positive switching for every application. For this added safety, see your electrical distributor or BullDog field engineer for complete details, or write BullDog direct. © BEFCO



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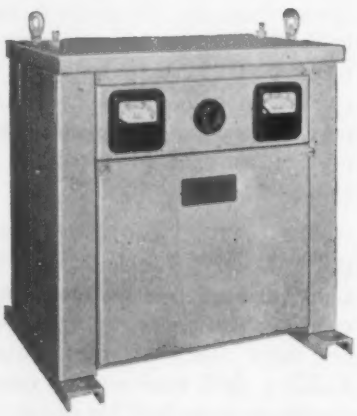

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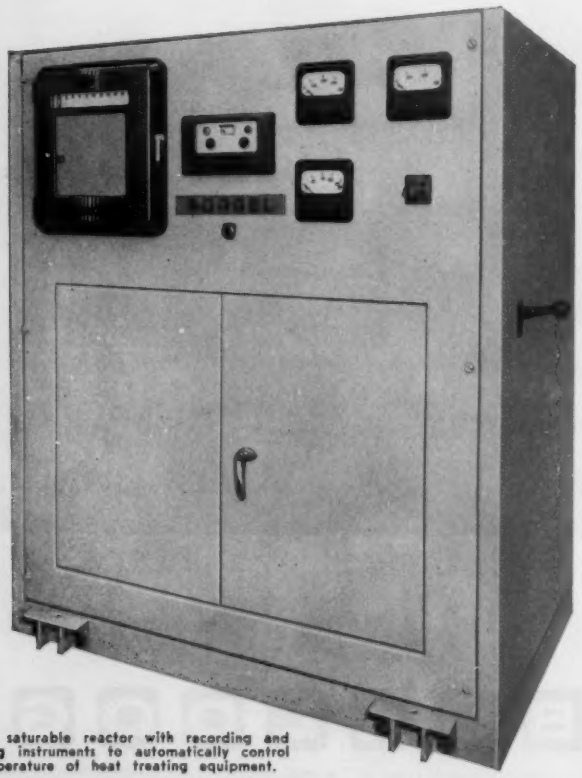

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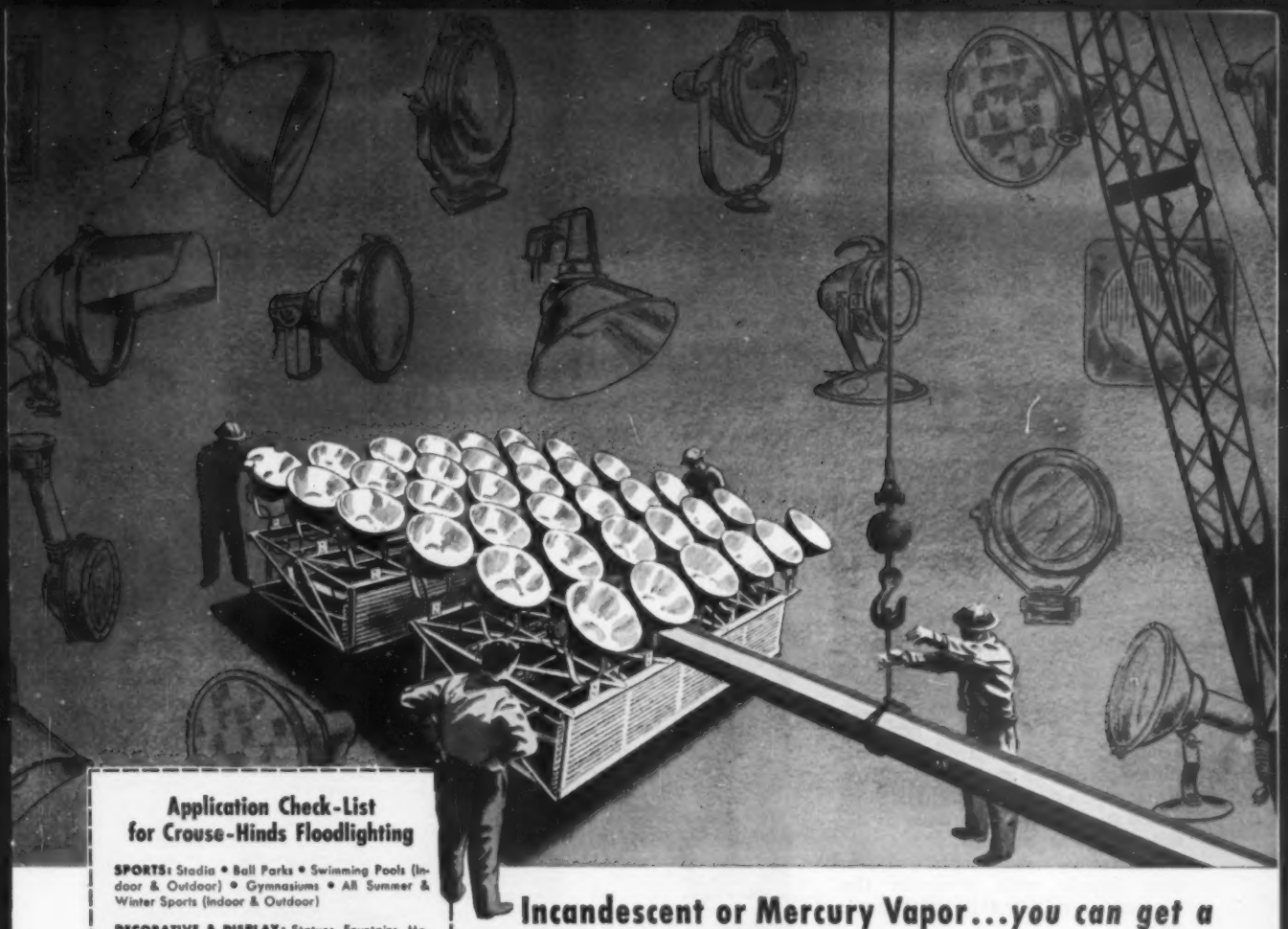

Application Check-List for Crouse-Hinds Floodlighting

SPORTS: Stadia • Ball Parks • Swimming Pools (Indoor & Outdoor) • Gymnasiums • All Summer & Winter Sports (Indoor & Outdoor)

DECORATIVE & DISPLAY: Statues, Fountains, Memorials & Monuments • Public Gardens • Building Fronts & Entrances • Park, Playground & Cemetery Entrances & Interiors

BUSINESS: Shopping Areas • Drive-Ins, Outdoor Theaters • Building Fronts & Entrances • Recreation Parks • Gas Stations

AIRPORT: Ramps • Boarding & Loading • Street & Road Approaches to Airport • Markers & Beacons • Emergency Portables

CONSTRUCTION: Roads & Streets • Dams, Seaways & Piers • Detours • Buildings • Reconstruction of Disaster Areas

INDUSTRIAL AND UTILITY: Parking Areas • Freight Yards • Weigh Stations • Docks & Piers • Staging Areas • Production Work Areas

TRAFFIC: Tunnels • Viaducts • Bridges • Underpasses • Walks • Public Squares, Thruway Interchanges & Rest Areas • Cloverleafs • Parking Areas

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A quick scanning of the widely varied applications included in the Check-List at left proves again that floodlights often provide *better light from few source points at less cost* than conventional lighting.

For the broadest experience and skill in every conceivable situation where floodlighting may be of use . . . call on Crouse-Hinds. Our field engineers will gladly assist with your planning. Just call your Crouse-Hinds distributor, or the nearest sales office or representative listed below.

Send us a brief description of your lighting problem, or an indication of the floodlight types in which you are interested. We will send literature containing product information applying to your problem by return mail.

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Contractors tell how

Photographs provide valuable job record

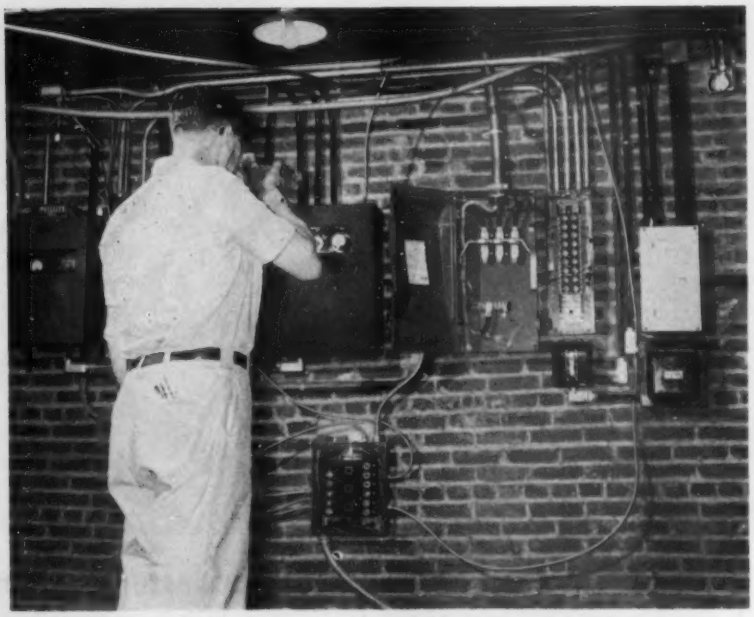
By A. A. Rickman
Vice-President, Engineer
E. C. Ernst Inc.
Washington, D. C.

◆ WHEN we are out estimating a job, we take a picture of the existing service for several reasons. First, an instantaneous picture provides us with an accurate record of physical conditions. Many a time an estimator returns from a job and asks himself how much space there was really available, what the precise layout was, as he vainly tries to recall. A picture details with precision the physical conditions he will work with.

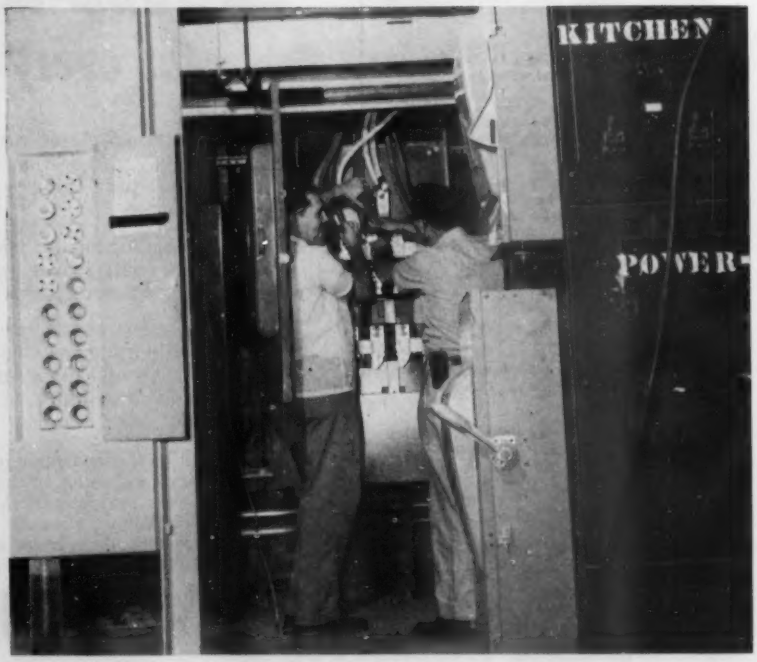
Secondly, a picture after our installation has been completed is something to present the layman-customer as an example of our workmanship. As you show him the variety of jobs you have handled, the size of a job, how greatly detailed the work was, how neat, compact and well-organized the completed job looks, he gets some idea of the calibre of your work. He is impressed as you identify the jobs you have handled for large companies or the government.

And thirdly, pictures of unusual jobs are valuable as records for your own use. Bringing back a picture of a new approach in handling a difficult job tells more than long detailed descriptions. Since staff members who did not work on the job did not see it, they are kept abreast of new approaches through new materials or new applications, as for example our use of interlocking armored cable where flexibility was the only solution in very limited space. A picture of 25 cables drawn through a 3-ft. opening in the structure had a new story to tell.

Pictures save your staff mem-



"Before" and "After" photos for the record are taken of every job by E. C. Ernst, Inc., electrical contractors, of Washington, D. C.



A 1200-ampere, three-phase, four-wire system is connected to new bus duct in a recent installation by E. C. Ernst, Inc., of Washington, D. C.

bers time in going out to see the job itself, when they were occupied with other jobs.

A picture also points up mistakes on a job that you may have made. It furnishes a key to improvements in future jobs.

"Before" and "after" pictures have even a further advantage. On occasion a question may arise by the customer. Difficult as it is to describe an old installation that no longer exists, you have an accurate record to talk from with a picture in front of you. A picture preserves your starting point.

A camera producing an instantaneous picture may be bought new for about $100; or a used camera for about $60. We have all pictures blown up to 5 x 7 for our own records and for the brochures we present to prospective customers. Cost comes to about $1 per picture: this covers film, flash bulbs, processing and blowups. We have found the investment and time well worth the advantages.

Front-mounted winch saves time and money

By Baron Creager

Southwestern Editor
Electrical South

◆ A WINCH mounted at bumper height on the front end of a pick-up truck and controlled from the cab paid for itself several times over on the first job in which it served for the L. G. White Electric Co., of Dallas, Texas.

White points out that there are many uses for winches mounted in the conventional manner and that such mountings are common. But the idea of mounting the winch forward is something different to the construction field.

The winch spool contains 600 feet of 700-pound test airplane cable. Winch, power take-off, mounting and all, cost a total of $600, but this was wiped out by a tremendous saving in man hours on the first job. The truck mounting a front-end winch is in use six months out of the year for pull jobs and has established an average saving of 50 per cent in man hours on such jobs. When not used for this purpose, the truck serves in normal capacity.

"We first used the winch and, in fact, installed it for the purpose, on a job at the Barksdale Air Force Base near Shreveport, La.," White explained.

"On that job there were a lot of manholes and a lot of long pulls. With the winch in front of the truck, we could get right up to the manhole. This ability saved a lot of time and several thousand dollars on that job.

"The great facility of the front-end winch is that you can get it right up to the job, in a building or wherever it is, almost. On a shopping district job we had pulls of from 50 to 300 feet. We have handled all sizes of heavy cable, from 2/0 to 750 MCM.

"Pulling rigs are all right for the lighter stuff. Only trouble is they have to be rigged up for each job and then dismantled. With the winch on the front of the truck we just pull up to the job and go to work."

This company also has a front-end boom, for heavy lifting, including small poles. The boom mounts and demounts with comparative ease and rapidity.

L. T. Vaux, construction superintendent at White Electric Co., of Dallas, examines winch on front end of pick-up truck. Savings in time and money result from the elimination of unnecessary reriggings and the ability to move in closer to a job for long and heavy pulls.

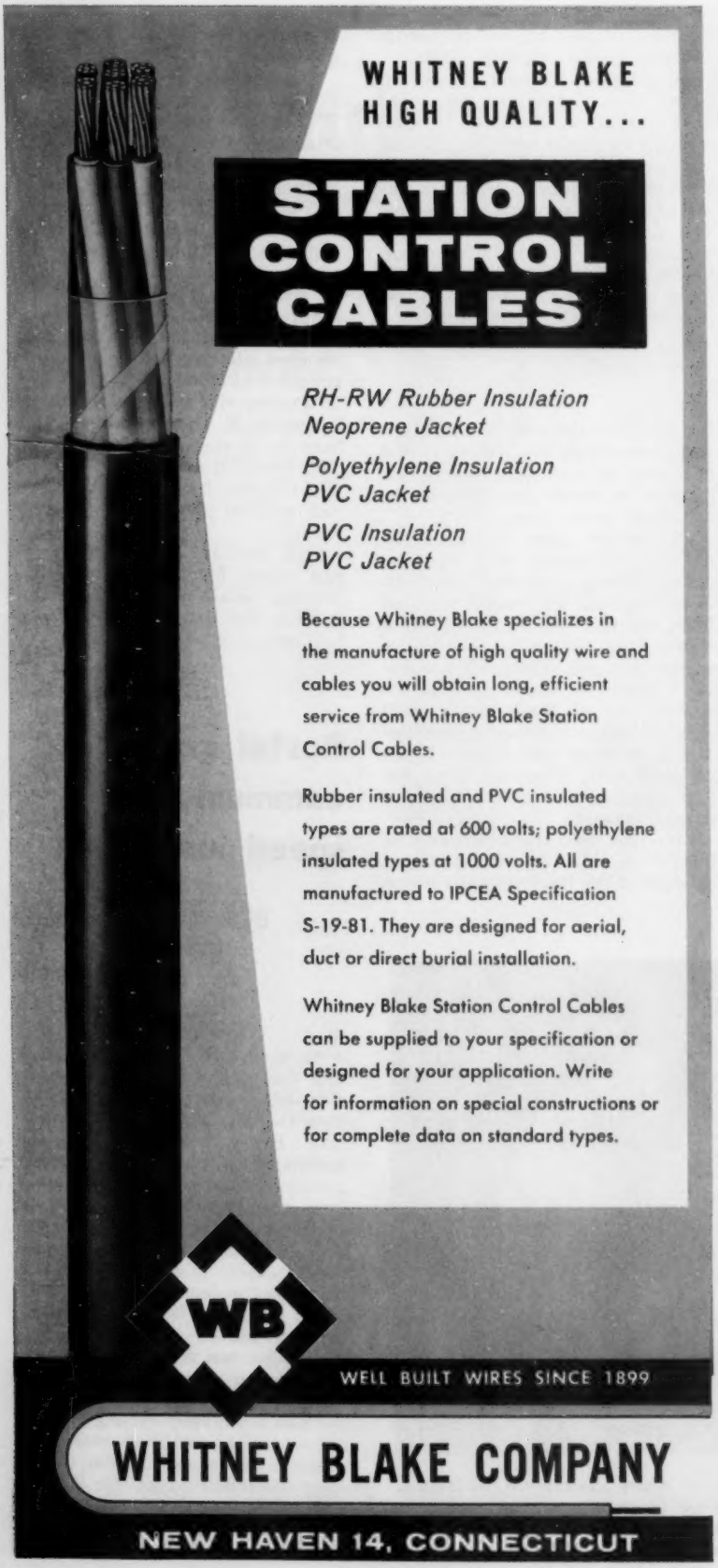
Postal card communications speed inspection

By William A. Goodman

Goodman Electric Co.
Riverdale, Md.

◆ ALL CONTRACTORS are familiar with the procedure of having to call the electrical inspector upon completing a job and notifying him that the job is ready for inspection. Every contractor has experienced a two- or three-day passage of time, and not hearing from the inspector assumed that the job had been inspected and approved, and forthwith presented his statement to a customer. Then belatedly he learns that the electrical inspector has been away from the office for a few days, and the job has not yet been inspected.

We found a way of eliminating this waiting period of uncertainty. We had a double-postcard printed and addressed to the electrical inspector's office asking him to inspect the indicated job for Rough, Final, Temporary, Wiring or Fixtures, giving him the permit number, address, and name of custom-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Contractor William A. Goodman addresses return postcards for the electrical inspector to notify him when job is inspected and approved.

er. A rubber stamp of our own name and address is placed at the bottom of the postcard, and also on the attached return postcard which he is to mail back to us after inspection. On the return postcard he may indicate comments over his signature and date. We fill in the rest.

We have learned the inspector's office likes our postcards very much. So do we. All doubt and uncertainty have been removed during a waiting period. We now have a permanent record of inspection and file the return card with the job folder.

In a log book we record date when the postcard was mailed to the inspector. Upon its return we okay the entry and date it. If the return card is not mailed back to us within two weeks, we check with the inspector's office by telephone, or mail another card. The log book and its record of mailed postcards keep us informed of the status on each job with regard to inspection.

This postcard is not a substitute for the certificate issued by electrical inspectors' offices in certain states or counties in accordance with the underwriter's law. However, we obtained approval from the inspector before we had postcards printed up, and won his cooperation. Postcards cost approximately six cents a piece for printing and mailing.

Other contractors have commented favorably on this procedure after adopting it.

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Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers ✔
- Consulting Engineers ✔

◆ OUR PURPOSE in this issue is to clear up several loose ends left over from the last two issues in our discussion of services. The Code requirements for grouping of service disconnecting means, for instance, has not been adequately clarified. Both sections 2351-a and 2360 provide rules for grouping, the latter being reserved for those conditions which are the most confusing. The first rule as given in section 2351-a states simply that the service disconnecting means shall be ". . . in a common enclosure, or in a group of seperate enclosures, located at a readily accessible point nearest to the entrance of the conductors, either inside or outside the building wall."

The members of Code Panel #3, I understand, have received complaints that this section could be misconstrued to imply that the disconnecting means is required to be placed at the weatherhead, this being the "point nearest to the entrance of the conductors." No doubt this section will be rewritten by Panel #3 to remove any possibility of such misconception.

Regardless of the wording now in use, the intent, at least, of this rule is to get the conductors past the weatherhead and on down to a point which must be not only readily accessible as this term is defined in Article 100, but also suitable for its intended use as required by section 1104-a. A point suitable for use as a location for grouped service disconnects is subject to varying interpretations and is a subject which in itself is quite controversial. We will return to this point as soon as we have finished delving into grouping.

Grouping service disconnects

The previously quoted statement in section 2351-a governs a single service only and is not meant to include the conditions of multiple occupancies outlined in section 2301-b, the different classes of use as outlined in section 2301-c, or the different conditions listed in section 2321. It means simply that the disconnecting means for any one service must be grouped together. Even section 2360, which governs a more involved condition, specifically exempts the conditions covered in the above mentioned sections for multiple occupancies, different classes of use, and the other previously mentioned different conditions.

The requirements of section 2360 go beyond those of section 2351-a in that section 2360 requires that the disconnecting means and all other associated "service equipment" be grouped even when served by more than one drop or more than one lateral if the additional drops or laterals supply such equipment at the same side of the building. It further requires that each such set of equipment be marked for identification.

It is rather difficult to imagine a condition where service equipment would be supplied at the same side of the building by more than one drop or lateral which is not exempt from the grouping requirement by section 2360, which is the same section requiring grouping in the first place.

It is a little difficult, therefore, to get sections 2360 and 2321 to agree, but as I interpret the intent, section 2360 permits each drop or lateral which is permitted by the Code to have a seperate group of its own without regard to other groupings from other drops or laterals.

Grouping example

Suppose, however, that an existing 2,000-ampere switch is located at point "A" which is suitable except that an increase in load as a result of extensive remodeling and air-conditioning requires an additional 2,000-ampere capacity or a total of 4,000 amperes. The space at point "A" where the existing 2,000-ampere service switch is located is not large enough to accommodate an additional 2,000-ampere switch, but at a distance of 50 feet away there is a point "B" which is suitable and which has sufficient room. There are three solutions to this problem:

(1) The existing 2,000-ampere service switch can be ripped out and replaced with a 4,000-ampere service switch, which in turn can supply a distribution board at point "B."

(2) A new 4,000-ampere service can be installed at point "B," using a 2,000-ampere switch to feed back

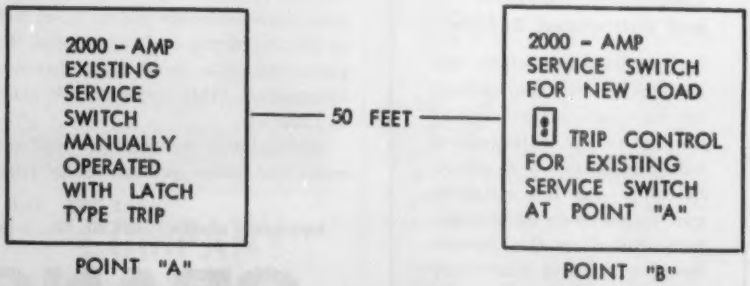

Fig. 1—How trip control switch governing service switch at point "A" may be installed at service switch location for new load in order to meet requirement of the Code as to grouping of service disconnects.

to the existing switch at point "A" after removing the existing lateral plus either one 2,000-ampere or several smaller switches for the new load, the total number not to exceed six.

(3) A new 2,000-ampere switch or the equivalant in several smaller switches could be installed at point "B" for the new load and also an electric trip control switch to operate the old existing switch at point "A", the total number at point "B" not to exceed six including the trip.

Solution # 3 is obviously the lowest in cost. But the question immediately arises, "Would it satisfy Code requirements for grouping?" Here we have one condition where two laterals supply current from the same side of the building. This brings up another question: "Would solution #3 satisfy Code requirements for only one lateral to the building?"

The second question would come under 2321-c which permits additional laterals for capacity requirements. But does 4,000 amperes reach the capacity for which an additional lateral is justified? Certainly a great deal more current than 4,000 amperes has been conducted over one set of laterals. Then who is to say in this case? Only one man--the inspector.

As an active inspector, I would, under the condition stated, permit an additional lateral (or drop). But if an additional lateral is permitted for capacity requirements, then the two sets are exempt by section 2360 from being grouped together. Although each set, if several switches were used at each point, would have to be grouped, the two sets would not be required to be adjacent to each other.

Although this contradiction appears to exist in the Code, it is my belief that the intent, under the conditions stated, is to have both sets grouped at one point unless a means is provided at one of the locations to control the other. And if provided with such a trip as above described, the requirement that service disconnect switches be of the manually-operable type would not be in violation because the switch would still be manually operable in addition to the electrically operated switch. (See Figure 1.)

Suitable locations

To return to the question of what constitutes a suitable point for service equipment, I should like to list a few points where I have seen service equipment mounted, not all of which were suitable: Clothes closets, storage rooms, bath rooms (above the rim of the tub), garages, kitchens, bedrooms, dining rooms, china closets, pantries, living rooms, halls, attics, basements, patios, crawl spaces, underneath buildings two feet off the ground, private poles, utility poles, machine rooms, janitor closets, boiler rooms, and switch rooms. I have never seen one on a flag pole!

To help us decide what is a suitable point that would satisfy section 1104-a, we can refer to sections 2351-a, 2372, 2435, 2436, and to definitions in Article 100.

Section 2351-a requires the service disconnecting equipment to be "at a readily accessible point nearest to the entrance of the conductors, either inside or outside the building wall."

Section 2372 requires the service overcurrent device to be integral with or adjacent to the disconnecting means.

Section 2435 requires this overcurrent device to be readily accessible, protected from mechanical injury, and not in the vicinity of easily ignitible material.

Section 2436 requires suitable enclosures, or switchboards located in rooms free from ignitible material and free from dampness.

In Article 100, readily accessible is defined as "Capable of being reached quickly, for operation, renewal, or inspection, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, chairs, etc."

In addition, Articles 384 and 710 as well as section 1116 has additional requirements for clearances and special requirements for switchboards and for higher voltages.

Analyzing requirements

Now we have enough information to aid in deciding whether or

Code test questions

1. Individual wires entering buildings shall pass inward and upward through slanting insulators, or shall enter through roof bushings. True or false?

2. Service cables mounted in contact with the building shall be supported at intervals not exceeding 4½ feet. True or false?

3. If service heads are used, conductors shall be formed into drip loops and connected to the drops at a point above the level of the weatherhead. True or false?

4. Service raceways need not be arranged to drain if made raintight. True or false?

5. Switchboards having exposed bus-bars on the back may be served with RHW conductors in raceways which terminate in metal bushings. True or false?

6. Two or three single-pole breakers may be installed on multi-wire circuits, one pole for each ungrounded conductor, as one multi-pole service disconnect provided that they are:

(a) equipped with handles within 3/16th inch proximity.

(b) identified.

(c) equipped with handle ties.

Which is correct: a? b? c?

7. The service disconnecting means must be:

(a) approved for service equipment.

(b) type A equipment.

(c) mounted flush if accessible to other than qualified persons.

Which is correct: a? b? c?

8. Multi-occupancy buildings may have service conductors run to each occupancy and each such service may have not more than six switches or circuit-breakers if:

(a) such buildings do not have individual occupancies above the second floor.

(b) such buildings are of fireproof construction.

(c) such switches or circuit-breakers are not equipped with handle ties.

Which is correct: a? b? c?

9. If the service switch does not interrupt the grounded conductor from the interior wiring:

(a) the neutral must be insulated.

(b) other means shall be provided in the service cabinet for disconnecting the grounded conductor.

(c) the neutral must be bare.

Which is correct: a? b? c?

10. In garages or outbuildings on residential property, the disconnecting means may consist of:

(a) a separate meter.

(b) a set of 3-way snap switches.

(c) an auxiliary gutter.

Which is correct: a? b? c?

Correct answers will be found at end of article.

not any given point is suitable for service equipment. Since the Code forbids climbing over or removing obstacles, a service directly over miladies bath would not be suitable for this purpose. And wouldn't you agree that ruffled skirts and Dacron sports shirts hanging loosely in a clothes closet constitute easily ignitible material?

Usually stored material would have to be moved to gain access to a service in a storage room, and so would the ingredients of a pantry or china closet. An attic may be accessible, but you could hardly call it readily accessible, nor would a crawl space or underneath a building be readily accessible. A

(Continued on page 109)

Questions on the Code

(Readers are invited to send in questions which they would like to see discussed in this department. Address them to Code Editor, ELECTRICAL SOUTH, 806 Peachtree St., NE, Atlanta 8, Ga.)

Ground contact indicator

QUESTION: It is not clear to me just what kind of device or instrument is required by section 5135-f-4, Article 510 of the Code, relating to a ground contact indicator for anesthetizing locations. This paragraph seems to say that signals should go in the hazardous area and then it says that they should not go there. Please explain.

ANSWER: The equipment referred to must be located outside of the hazardous area but at a point which is visible to those who are within the hazardous area. This is difficult to accomplish on some hospital operating floors. Most inspection authorities, however, accept without question the location in the hall over or near the head nurse's desk. Many inspectors prefer, and some insist, on this location. The head nurse's desk is always outside of the hazardous area; and since she is alert to the business at hand and never, or very seldom, at any great distance from her desk, she has the indicating devices always under surveillance. See accompanying sketch, Figure 2, for diagram of equipment suitable for the application.

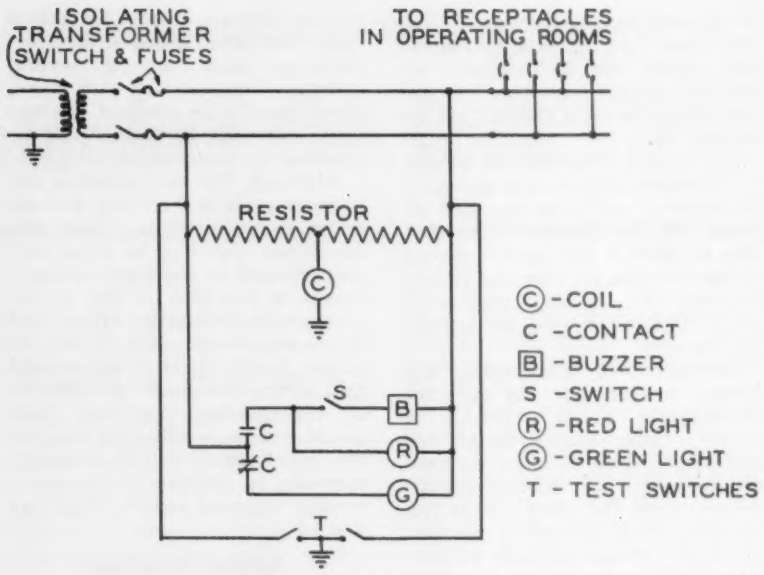

Fig. 2—Simplified sketch of ground contact indicator required for hospital operating rooms (anesthetizing locations). Switch is usually on a time relay. Green light burns normally through normally-closed contact. A ground on either leg of 10,000 ohms or less allows operating coil to open contact to green light and close contact to red signal light and signal buzzer, alerting operating personnel.

Grounding conductor size

QUESTION: What size system grounding conductor should I use if of copper and if of aluminum for 2,000-ampere service?

ANSWER: Section 2594 requires that No. 3/0 be used for the system grounding conductor for services using over 1,100,000 CM unless made electrodes are used in which case No. 6 is permitted. (Underground cold water piping must be used if available). Section 2591-a states ". . . If the grounding conductor is not of copper, its electrical resistance per linear foot shall not exceed, and its tensile strength not be less than that of the allowable copper conductor for such a purpose." Table 18 in Chapter 10 lists 3/0 copper (bare untinned) as having .0642 ohms dc resistance per thousand feet, or .000642 per foot. This figure falls between 250 MCM aluminum with .0708 ohms per M feet and 300 MCM with .0590 per M feet. The latter, 300 MCM, would therefore have to be used if aluminum is selected, and it has a resistance of .000059 ohms per foot. It must also have the equivalant tensile strength. Information regarding tensile strength would have to come from the manufacturer of the wire selected.

The size given, of course, in each case is the minimum permitted by the Code. Many engineers, however, require that the system grounding conductor be not less than 25% of the carrying capacity of the phase conductors. This is good engineering practice as a general rule.

In some cases, unfortunately, the only available water pipe electrodes are so small that they are limited in the amount of current which they can carry. In such cases, extremely large conductors are considered by some authorities to be superfluous as they are similarly considered also when used with made electrodes.

You might be interested in knowing that the National Electrical Safety Code requires that the system grounding conductor have a capacity of not less than one-fifth that of the phase conductors for a-c systems. In any case, it is well to bear in mind that no matter how eleborate the grounding system, it is of little value if high fault currents are blocked by inadequate electrodes and earth connections.

The greater these fault currents, the lower the resistance must be for the overcurrent device to function, because the required resistance varies inversely with the fault current to ground. Where adequate electrodes are not available, supplementary electrodes should be installed and bonded together into a grid of sufficiently low resistance.

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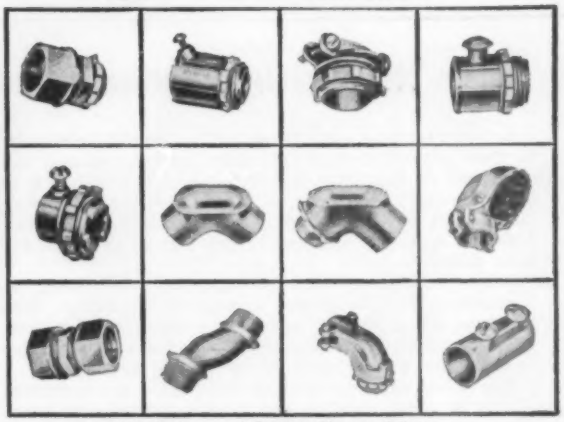

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New, revised estimating tables continued in this issue

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

EXPANSION FITTINGS

Conduit SIZE	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
1/2"	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20
3/4"	.38	.48	.57	.67	.76	.86	.95	1.05	1.14	1.24	1.33	1.43
1"	.45	.54	.65	.75	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61
1 1/4"	.49	.61	.74	.86	.98	1.10	1.23	1.35	1.47	1.59	1.72	1.84
1 1/2"	.54	.68	.81	.95	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03
2"	.65	.81	.98	1.14	1.30	1.46	1.63	1.79	1.95	2.11	2.28	2.44
2 1/2"	.76	.95	1.14	1.33	1.52	1.71	1.90	2.09	2.28	2.47	2.66	2.85
3"	.86	1.08	1.29	1.51	1.72	1.94	2.15	2.37	2.58	2.80	3.01	3.23

E-101-B

LABOR: Installation & assembly only. (Add for cutting & threading as required.)

7-58

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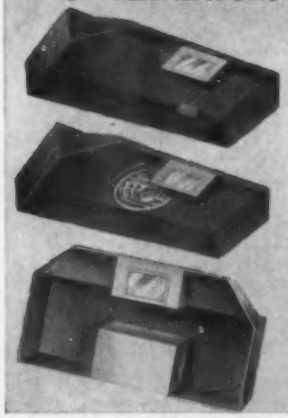

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GROUND RODS
COPPERWELD

ROD SIZE LENGTH	HOURS Ea.	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
3/8" x 5'	.74	.93	1.11	1.30	1.48	1.67	1.85	2.04	2.22	2.41	2.59	2.78
3/8" x 6'	.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00
1/2" x 5'	.74	.93	1.11	1.30	1.48	1.67	1.85	2.04	2.22	2.41	2.59	2.78
1/2" x 6'	.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00
1/2" x 7'	.85	1.06	1.28	1.49	1.70	1.91	2.13	2.34	2.55	2.76	2.98	3.19
5/8" x 6'	.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00
5/8" x 7'	.85	1.06	1.28	1.49	1.70	1.91	2.13	2.34	2.55	2.76	2.98	3.19
5/8" x 8'	.90	1.13	1.35	1.58	1.80	2.03	2.25	2.48	2.70	2.93	3.15	3.38
5/8" x 10'	1.5	1.88	2.25	2.63	3.00	3.38	3.75	4.13	4.50	4.88	5.25	5.63
5/8" x 12'	2.0	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50
3/4" x 6'	1.0	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75
3/4" x 7'	1.11	1.39	1.67	1.94	2.22	2.50	2.78	3.05	3.33	3.61	3.89	4.16
3/4" x 8'	1.2	1.50	1.80	2.10	2.40	2.70	3.00	3.30	3.60	3.90	4.20	4.50
3/4" x 9'	1.5	1.88	2.25	2.63	3.00	3.38	3.75	4.13	4.50	4.88	5.25	5.63
3/4" x 10'	1.8	2.25	2.70	3.15	3.60	4.05	4.50	4.95	5.40	5.85	6.30	6.75
3/4" x 12'	2.4	3.00	3.60	4.20	4.80	5.40	6.00	6.60	7.20	7.80	8.40	9.00
1" x 10'	2.4	3.00	3.60	4.20	4.80	5.40	6.00	6.60	7.20	7.80	8.40	9.00
1" x 12'	3.3	4.13	4.95	5.78	6.60	7.43	8.25	9.08	9.90	10.73	11.55	12.38
					PIPE							
3/4" x 6'	1.2	1.50	1.80	2.10	2.40	2.70	3.00	3.30	3.60	3.90	4.20	4.50
3/4" x 7'	1.3	1.63	1.95	2.28	2.60	2.93	3.25	3.58	3.90	4.23	4.55	4.88
3/4" x 8'	1.4	1.75	2.10	2.45	2.80	3.15	3.50	3.85	4.20	4.55	4.90	5.25
3/4" x 9'	1.7	2.13	2.55	2.98	3.40	3.83	4.25	4.68	5.10	5.53	5.95	6.38
3/4" x 10'	2.0	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50

E-101-B

LABOR: INCLUDES MATERIAL HANDLING AND DRIVING ROD.

7-58

GROUND WIRE
INSTALLED IN CONDUIT (INSULATED)

WIRE SIZE	HOURS "C"	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
8	3.1	.039	.047	.054	.062	.07	.078	.085	.093	.101	.109	.116
6	4.1	.051	.062	.072	.082	.092	.103	.113	.123	.133	.144	.154
4	5.2	.065	.078	.091	.104	.117	.13	.143	.156	.169	.182	.195
2	6.3	.079	.095	.11	.126	.142	.158	.173	.189	.205	.221	.236
1	7.3	.091	.11	.128	.146	.164	.183	.201	.219	.237	.256	.274
1/0	8.5	.106	.128	.149	.17	.191	.213	.234	.255	.276	.298	.319
2/0	9.6	.12	.144	.168	.192	.216	.24	.264	.288	.312	.336	.36
3/0	10.8	.135	.162	.189	.216	.243	.27	.297	.324	.351	.378	.405
4/0	12.5	.156	.188	.219	.25	.281	.313	.344	.375	.406	.438	.469
					ARMORED INSTALLED OPEN							
8	2.5	.031	.038	.044	.05	.056	.063	.069	.075	.081	.088	.094
6	3.3	.041	.05	.058	.066	.074	.083	.091	.099	.107	.116	.124
4	4.2	.053	.063	.074	.084	.095	.105	.116	.126	.137	.147	.158

E-102-B

LABOR: INSTALLING AND CUTTING WIRE AND CONNECTING AT GROUNDING END. (ADD FOR ATTACHING GROUND CLAMP).

7-58

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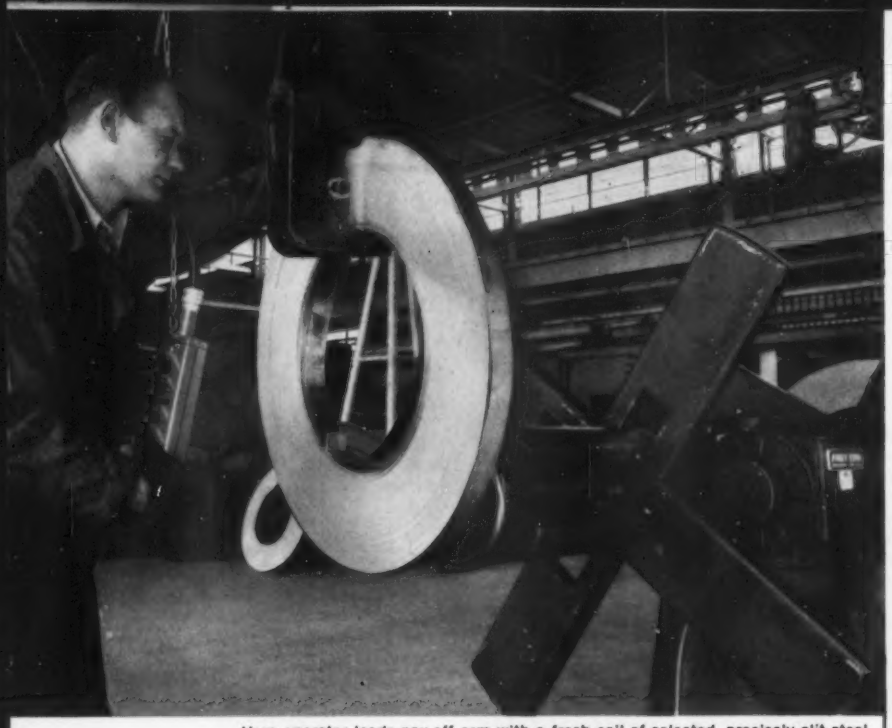

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News of the industry

edited for Southern readers

Lighting standards widely distributed

"HISTORY-MAKING acceptance" of the lighting industry's first set of minimum residential standards has been reported by the American Home Lighting Institute, trade association of residential fixture manufacturers and distributors. The standards call for at least one lighting fixture in every room and detail minimum requirements for every area in the home.

Forty-five thousand copies of the Light for Living standards have been requested by contractors, builders, architects, decorators, utilities, manufacturers, and distributors since August, 1957, when the standards were first announced.

"Increasing use of the standards from coast to coast indicates thousands of 1958 homes will be equipped with far better lighting than the average home of the past," according to Edward H. R. Blitzer, president of AHLI.

The Institute's standards are briefed down to a single sheet of paper. They cover the size and type of lighting fixture needed for each area in the home. For living areas, the standards detail the lighting for small, average, and large rooms.

Individual copies of the Light for Living standards are available at no charge from the American Home Lighting Institute, 360 N. Michigan Ave., Chicago 1, Ill. A price sheet for quantity orders is available on request.

Distributors elect Hamblen president

THE NATIONAL Association of Electrical Distributors, meeting recently in San Francisco, Calif., for its Fiftieth Anniversary Convention, elected J. P. Hamblen as president for the coming year. He succeeds George Albiez, president of Englewood Electrical Supply Co., of Chicago.

Mr. Hamblen is president of the Southern Electric Supply Co., of Houston, with branches in Austin, Beaumont, Corpus Christi and San Antonio. Mr. Hamblen most recently served NAED as vice-president of the Southern Region. As president, he will serve as a member of the Association's ten-man executive committee.

J. A. Meier was named to succeed Mr. Hamblen as president of the NAED Southern Region. Mr. Meier heads the Florida Electric Supply, Inc., of Tampa, Jacksonville, Miami and St. Petersburg.

Vice-Presidents re-elected included George W. Provost, Jr., president, Doubleday-Hill Electric Co., of Pittsburgh, (Eastern Region); and J. M. Vilett, president, Northland Electric Supply Co., of Minneapolis, (Central Region).

J. P. Hamblen

PRESCOLITE REPRESENTATIVES IN PUERTO RICO — Approximately seventy-five officials and representatives of the Prescolite Manufacturing Company met recently in San Juan, Puerto Rico, for the company's fifth annual sales-product convention. Two chartered planes leaving from New York and Miami transported participants to San Juan.

Day-Brite plans new manufacturing plant

SWEEPING PLANS for immediate progress in the construction of a large new lighting fixture plant at Sunnyvale, Calif., were announced recently in St. Louis by the board of directors of Day-Brite Lighting, Inc.

First step in the new, hard-driving program, was the naming of Stanley M. Bixler, presently vice-president and general manager of Day-Brite's California company to the post of senior vice-president and general manager of the national organization.

"We are going to proceed rapidly with our plans to build one of the nation's largest and most modern lighting fixture manufacturing plant in Sunnyvale," Mr. Bixler said. The plant, which will employ up to 400 people, will be constructed on a 30 acre site, and is designed to permit expansion in accordance with the tremendous growth of the company, which is anticipated under the new program, Mr. Bixler added.

Under the new management arrangement, which is effective immediately, Mr. Bixler will transfer to St. Louis where he will assume the responsibilities of Day-Brite's national operations. These include plants in St. Louis and Tupelo, Miss., as well as branch offices throughout the nation. He will con-

tinue to serve as vice-president and general manager of Day-Brite Lighting of California, a wholly-owned subsidiary.

The California company distinguished itself financially this year when it was announced that sales had increased 50.5% over 1956, putting the operation well into the black.

Day-Brite manufactures an extensive line of lighting fixtures for business and industry which are distributed throughout the nation and in many foreign countries.

Before becoming associated with Day-Brite in 1957, Mr. Bixler was a top executive with the Continental Can Co. for 24 years, serving in various management capacities throughout the United States.

ARI releases new room air-conditioner ratings

THE SECOND EDITION of its 1958 list of room air-conditioner ratings was issued recently by Air-Conditioning and Refrigeration Institute, based on the reports of 31 manufacturers and merchandising companies. The ratings are stated in terms of British thermal units per hour (Btuh) of cooling capacity, as established in accordance with ARI Standard 110-58.

In the new booklet, 15 manufacturers have added to their model listings or revised the ratings of some models as published in the April 4 edition, and the ratings of nine remain the same as those published earlier for all models. In addition, seven manufacturers or private brand merchandisers are listed for the first time in the second edition.

As in the first edition, the revised list makes no reference to tons or horsepower of compressor motors, terms which formerly were used to express capacity, but which have been discarded as non-applicable. The list also includes the total watts input, nameplate volts and amperes, cycles and phase of motors, and the number of the refrigerant used.

NLB announces lighting course

THE NATIONAL Lighting Bureau is now offering its industrial and commercial lighting training course for contractors and other lighting salesmen without its former requirement of adopting an entire lighting promotion program, it has been announced by Laurance C. Messick, manager of the Bureau.

The training course, which includes technical aspects of calculation and layout, as well as sales methods in selling lighting to potential customers, is considered by experts in all segments of the lighting industry to be one of the best fundamental courses available.

The training material includes a student text book having six chapters devoted to selling and seven chapters devoted to lighting design. Combined in a ring binder, it becomes a permanent reference for the graduate of the course. Besides this text book, there is a kit containing such teaching props as slides, film strips, records, posters and other pieces designed for effective presentation of the course. These teaching props may be rented or purchased outright.

To simplify conduct of the course, a Course Leader's Manual and a set of Meeting Guides have been prepared. These provide detailed instructions for the conduct of each session.

The training course is flexible enough to be adapted to local facilities. In some instances, the local utility may be able to supply instructors from its staff. In other areas, perhaps a university or trade school may arrange to give students credit for the course.

For additional information, write to National Lighting Bureau, 155 E. 44th St., New York 17, N. Y.

Industrial Forum cites electromation

SOME 300 Houston area industrial executives recently attended the second annual Houston Industrial Forum for Increased Productivity.

The Forum, jointly sponsored by Houston Lighting & Power Company and Westinghouse Electric Corp., covered the necessity of plant modernization and mechanization in this extremely competitive era.

While recognizing that business readjustment has slowed growth somewhat, Mr. Dillon Anderson, senior partner of Baker, Botts, Andrews & Shepherd, pointed out that business today has the tendency to push the "panic button" at what are actually normal fluctuations in a business cycle.

Technical subjects covered included management's responsibility as champions of automation, modernization of existing industrial plants, industrial air conditioning, electric process heating, new materials available, the importance of quality control, planned lighting, preventive maintenance and modernization.

The Forum is the result of continuing efforts by both Houston Lighting & Power Company and major manufacturers to promote

Richard P. Smith heads publishers association

RICHARD P. SMITH, president of W. R. C. Publishing Co., of Atlanta, publishers of ELECTRICAL SOUTH, was elected chairman of National Business Publications, at its recent national convention in Asheville, N. C. Mr. Smith succeeds Russell C. Jaenke, president of Penton Publishing Co., of Cleveland, Ohio.

A graduate of Virginia Military Institute, Mr. Smith became president of W. R. C. Smith Publishing Company in 1953, succeeding W. J. Rooke, who became chairman of the board. Mr. Smith has been associated with the company since 1934. He worked up through the company's circulation and other departments and later became business manager of *Textile Industries*, and then executive vice-president of the company. During World War II he served in the SHEAF with the rank of major.

A former director of BPA, Mr. Smith served as vice-chairman prior to his recent election as chairman. He has served as

Richard P. Smith

secretary-treasurer of the Atlanta Advertising Club, president of the Atlanta Rotary, and president of Atlanta Childs' Home.

W. R. C. Smith publications, in addition to ELECTRICAL SOUTH, include *Southern Power and Industry, Southern Building Supplies, Southern Hardware, Southern Automotive Journal*, and *Textile Industries*.

KEARNEY ADDS TENSILE TESTER—The James R. Kearney Corp., of St. Louis, Mo., recently added a Riehle 60,000 lb. horizontal tensile testing machine to their extensive facilities. With this new equipment tests are conducted on compression splicing sleeves and allied products with accuracy of less than one-half of one per cent.

the most efficient spending of industry's electrical dollar.

Lamar W. McLeod, vice-president in charge of Westinghouse's southwestern region, told those attending the Forum that "electromation"—a word coined to show that electrical energy is necessary to power automation—"is not a luxury any more. Rather it is a basic tool of business and production", he said.

"The demand for goods is bound to increase by 40 per cent in the next five years while the labor force will increase only 13 per cent," Mr. McLeod said.

Mr. McLeod referred to results of a recent survey of 550 leading industrial plants in the country to determine how well prepared they were for the increased use of electricity necessary for continuous processing and automatic handling where built-in, self-regulating devices speed production and improve quality.

"All 550 plants have complete engineering staffs devoting full time to such things as electrical facilities, but not one plant had adequate main transformer capacity for loads needed for a ten-year growth." Mr. McLeod said.

"To say that American industry is underpowered today is an understatement. What good are all these dreams of electromation and increased output per worker if the very energy that is going to make this possible can't even get in the front door?" asked Mr. McLeod.

Speakers from Houston Lighting & Power Company included T. H. Wharton, executive vice-president; H. Fred Staacke, vice-president; and W. A. Kuenemann, manager, industrial sales department.

Westinghouse speakers included W. M. Oliver, Houston area sales manager; Mr. McLeod; B. D. Henderson, vice-president; J. G. Ford, manager, manufacturing engineering; J. Manuele, director of quality control; A. W. Larson, sales manager, lighting division; and H. R. Larson, manager, maintenance and repair division.

Representing the Edwin L. Wiegand Company was Mr. W. S. Eyth, Industrial Sales Manager.

Alcoa expands aluminum market

A MOVE TO OPEN a major new market for aluminum in the electrical field has been announced by Aluminum Company of America.

Alcoa has purchased the transformer division of Automation Instruments, Inc., at Boulder, Colo., along with all technical data and research and development equipment in possession of that unit.

Alcoa's market objective is the application of aluminum foil and sheet strip windings for transformers and miscellaneous electrical equipment. Automation Instruments, through its transformer division, has made important developments in this field. An indication of the potential market for aluminum is the fact that coil windings annually consume 475-million pounds of copper magnet wire.

The newly acquired facility will be moved to Alcoa Research Laboratories, New Kensington, Pa. There, further research on aluminum strip windings will be accelerated. To contribute to this effort Irving O. Schaefer, chief research engineer for Automation

WESTINGHOUSE REPAIR PLANT COMPLETED—The new manufacturing and repair facilities of Westinghouse in Kansas City, Mo., include equipment for the repair of all sizes of electrical equipment such as power transformers, generators, motors and controls, plus the manufacture or modification of similar specialized equipment. In addition, the plant will provide fractional horsepower motor service.

Instruments' transformer division, will join the research staff of Aluminum Company of America.

Philip T. Coffin, Alcoa's manager of electrical industry sales, explained that the company does not intend to engage in the manufacture of electrical coils.

"We plan to use our new facilities to assist the manufacturers of electrical windings to incorporate aluminum foil and sheet strip into their products," Mr. Coffin explained.

Florida contractors set convention date

THE FLORIDA Association of Electrical Contractors has announced that its Annual Convention and Sixth Electrical Trade Show will be held this year at the Hotel George Washington, in West Palm Beach, October 9 through 11, according to a recent announcement by L. L. Dick, state manager.

Ballast publication issued bi-monthly

THE FIRST EDITION of CBM News, a bi-monthly newsletter presenting timely information of advances in ballasts and fluorescent lighting, has just been released, according to Don Julien, secretary of Certified Ballast Manufacturers Association, which is publishing the newsletter.

The first issue reports on the organization of a committee composed of members of CBM, RLM and NEMA jointly to attack the problem of heating in modern fixtures. It also announced the availability of Certified Ballasts for 72-inch 1000 ma and 800 ma rapid start lamps.

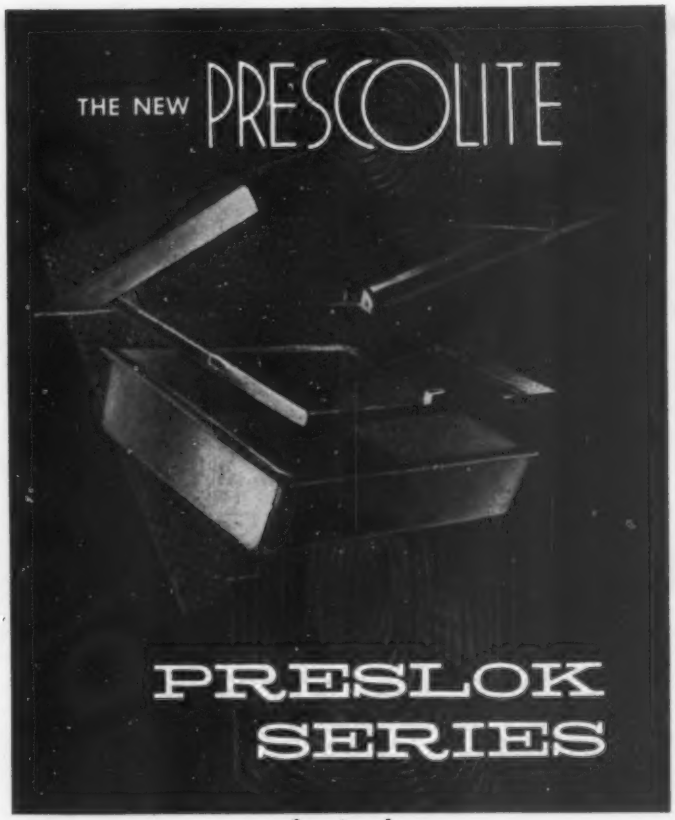
Anyone interested in receiving CBM News will be put on the mailing list by writing to Certified Ballast Manufacturers Association, 2116 Keith Bldg., Cleveland 15, Ohio.

Distribution center planned for New Orleans

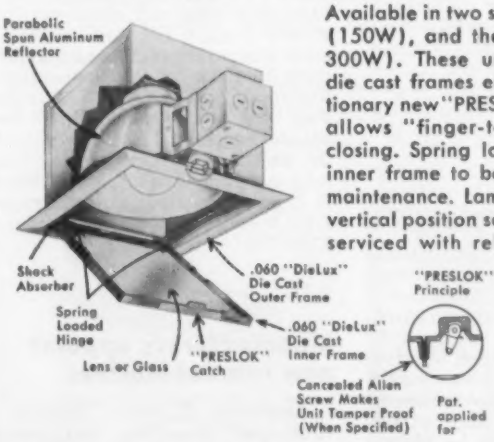
WESTINGHOUSE Electric Corporation has announced plans to build a product distribution center at New Orleans, La.

Otis O. Rae, vice-president in charge of the company's Southeastern region, said that new building will be part of a nation-wide network of distribution centers being established by Westinghouse to provide improved customer service and shorter product delivery time.

To be located on Carrollton Ave-

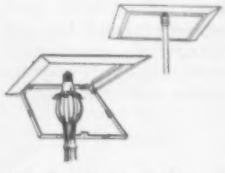


featuring
A New Conception in Hinged Frames for Recessed Lighting Fixtures


Parabolic Spun Aluminum Reflector
Shock Absorber
Spring Loaded Hinge
Lens or Glass
"PRESLOK" Catch
.060 "DieLux" Die Cast Outer Frame
.060 "DieLux" Die Cast Inner Frame
Concealed Allen Screw Makes Unit Tamper Proof (When Specified)
"PRESLOK" Principle
Pat. applied for

Available in two sizes—the 1014 Series (150W), and the 1317 Series (200-300W). These units utilize "DieLux" die cast frames employing the revolutionary new "PRESLOK" principle which allows "finger-touch" opening and closing. Spring loaded hinge enables inner frame to be easily removed for maintenance. Lamp and socket are in vertical position so that the unit may be serviced with relamping pole. Units employ critically engineered full reflector for maximum performance.

With a touch of the finger or lamp pole changer the inner frame with lens swings down for cleaning or relamping, yet locks firmly in closed position. Special shock absorber prevents glass breakage.
Available in a wide range of glass and lens styles as well as several frame finishes.



Write for your copy of the Complete PRESCOLITE Catalog

PRESCOLITE MANUFACTURING CORPORATION
HOME OFFICE: 2229 Fourth Street, Berkeley, California
FACTORIES: Berkeley, Calif. • Neshaminy, Pa. • El Dorado, Ark.

Sam Resnick, right, president of Eastern Fixture Company, examines latest lighting catalog with Glen H. Arnold, newly appointed southern sales representative for the Boston manufacturer.

nue just north of Canal Street, the center will consolidate Westinghouse sales offices in the New Orleans area which handle x-ray equipment, air handling and air cleaning equipment, elevators, and packaged air conditioners.

It will also serve as a warehouse and headquarters for Westinghouse Appliance Sales, which distributes major appliances, room air conditioners, dehumidifiers, vacuum cleaners, television and high-fidelity receivers and as a lamp division sales and warehouse facility.

Westinghouse Electric Supply Company (WESCO) will continue to maintain separate headquarters and facilities.

Initially, the distribution center will be responsible for consumer product distribution for metropolitan New Orleans and the greater part of Louisiana, as well as a large area of southwestern Mississippi. Electrical apparatus warehouse storage for use by utilities, industrial companies and other customers will eventually be added to the consumer lines.

Brief new notes of manufacturers

ELECTRO SILV-A-KING Corporation has announced that effective immediately it will now be known as the Electro Lighting Corporation. The firm manufacturers and designs commercial and industrial fluorescent, incandescent and mercury lighting fixtures at facilities in Chicago, Ill., Reading, Pa., and Redwood City, Calif.

* * *

MELROSE LIGHTING Company plans to occupy new and enlarged manufacturing and office facilities in late August. Located on a three-acre site at Fort Washington Industrial Park on the Pennsylvania Turnpike near Fort Washington, Pa., the new plant has been planned so that it can conveniently be expanded from its originally laid out 15,000 sq. ft. to 45,000 sq. ft. Cost of the plant, equipment and land is estimated at approximately $250,000.

Manufacturers appoint new representatives

AMERICAN BLOWER Division of American Standard has named Russell L. Johnson as southwestern merchandise manager to service jobbers in the Dallas, Houston, San Antonio, New Orleans and Shreveport areas. Mr. Johnson will provide sales and application engineering assistance in connection with the company's line of packaged merchandise products (attic and kitchen fans, unit heaters, supply and exhaust fans and fluid drives), commercial air conditioning equipment, and special products.

J. A. WEAVER Co., of St. Louis, Mo., has announced the appointment of Specialty Electrical Sales Company as sales representative in Maryland and the District of Columbia. B. L. Taylor and J. M. Crosby will maintain offices at 4010 Glengyle Ave., Baltimore.

* * *

MALLEABLE IRON FITTINGS Co., of Branford, Conn., recently appointed Jake Rudisill Associates, 1312 Myrtle Ave., Charlotte 3, North Carolina, to represent the Pole Hardware Division in the states of North and South Carolina and eastern Tennessee.

* * *

SILVRAY LIGHTING, Inc., has named several new sales representatives for areas in the southeast. Sidney Chilton, of Memphis, was appointed to service Western Tennessee and Northern Mississippi. Joseph N. Crevasse will cover the Jacksonville, Fla., area while his associate, George N. Jack, will serve the Tampa territory. James A. Foerster will represent Silvray in Miami. Western Florida will continue to be serviced by William D. Faust, of New Orleans.

* * *

EASTERN FIXTURE Company of Boston, Mass., announces the appointment of Glenn H. Arnold as sales representative for Georgia, Alabama and Tennessee.

* * *

J. H. HOLAN Corporation has announced the appointment of F. Thomas Winder as sales represent-

F. Thomas Winder

ative in Texas and Oklahoma for the company's line of truck bodies and associated power equipment.

* * *

KEYSTONE Manufacturing Co., of Warren, Mich., has announced the appointment of seven new southeastern representatives for its line of wiring installation equipment. They are the Alfred L. Daniels Co.,

Baltimore, Md.; Fred Shelor, Richmond, Va.; Cary Chapman and Co., Greensboro, N. C.; Whitfield Agencies, Hialeah, Fla.; Jones-Philbert and Co., New Orleans, La.; Colin Finney, Nashville, Tenn.; and William E. Jobes, who will serve Kentucky accounts from headquarters in Indianapolis, Ind.

Dates Ahead

American Institute of Electrical Engineers, Petroleum Industry Conference, Baker Hotel, Dallas, Sept. 15-17, 1958.

Public Utilities Association of the Virginias, 40th Annual Meeting Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 18-21, 1958.

Edison Electric Institute, Meter and Service Committee, Plaza and Driscoll Hotels, Corpus Christi, Texas, Sept. 22-24, 1958.

Florida Association of Electrical Contractors, Annual Convention and Sixth Electrical Trade Show, Hotel George Washington, West Palm Beach, Fla. Oct. 9-11, 1958.

Oklahoma Utilities Assn., Light and Power Conference: Eastern District, Western Hills Lodge, Lake Sequoyah, Wagoner, Okla., Oct. 16, 1958; Western District, Lawtonian Hotel, Lawton, Okla., Oct. 17, 1958.

Southeastern Electric Exchange, Engineering and Operation Section, Hotel Roanoke, Roanoke, Va., Oct. 20-21, 1958.

International Association of Electrical Inspectors, Southern Section Thirtieth Annual Meeting, McAllister Hotel, Miami, Fla., Oct. 20-22, 1958.

Power Distribution Conference, University of Texas, Austin, Tex. Oct. 20-22, 1958.

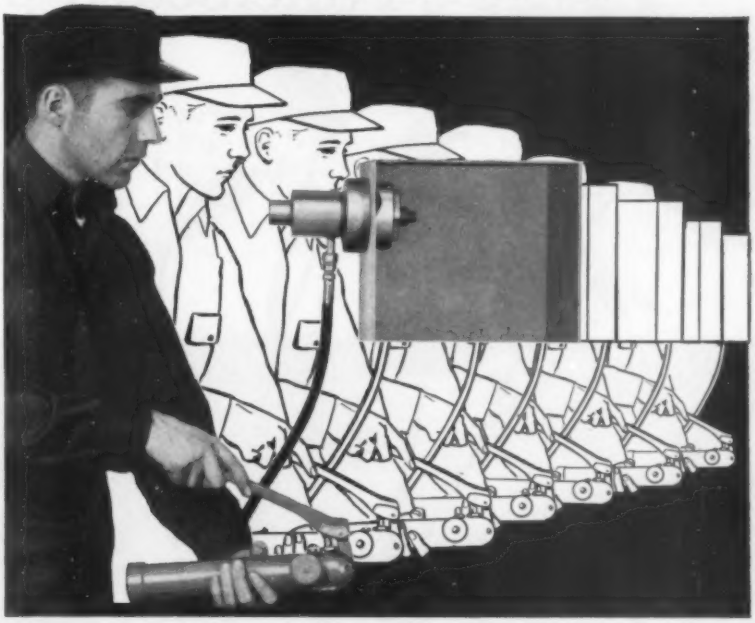
National Association of Corrosion Engineers, South Central Region Annual Conference and Exhibition, Roosevelt Hotel, New Orleans, Oct. 20-24, 1958.

National Electrical Contractors Association, Annual Convention, Dallas, Texas, Nov. 19-22, 1958.

Oklahoma Utilities Assn., Annual Convention, Mayo Hotel, Tulsa, Okla., March 26-27, 1959.

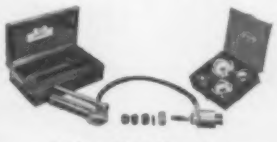
By Saving Minutes, You Save Hours

...WITH THE GREENLEE HYDRAULIC KNOCKOUT PUNCH DRIVER



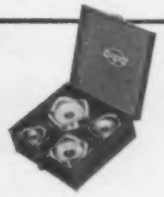
You make smooth holes for up to 5-in. conduit *in seconds* with the GREENLEE No. 7646A Hydraulic Knockout Punch Driver . . . and the valuable minutes you save on every hole quickly add up to hours! This small and handy, yet extremely powerful, driver operates *all* GREENLEE Knockout Punches and is recommended for cutting entirely new openings in metal through 10 gauge. A few easy strokes of the handle, and the slug drops loose in the die! Ask your distributor for this timesaving drive—to use with your present GREENLEE punches—or the handy sets, including punches, shown below:

Set No. 7306, with punches for ½"—2" conduit



Set No. 7310, with punches for ½"—4" conduit

No. 7646A Hydraulic Knockout Punch Driver



Set No. 7304 —4 punches for 2½"—4" conduit

Knockout Punch No. 743 is available for 5" conduit

GREENLEE

WRITE for illustrated bulletin giving full details and prices.

GREENLEE TOOL CO., 1787 COLUMBIA AVE., • ROCKFORD, ILLINOIS, U.S.A.

Panelboard planning helps

The special requirements inherent in modern hospital function make design and selection of the proper components to POWER-UP the electrical system far more exacting than for many other applications.

One example of careful electrical planning is the United States Naval Hospital addition at San

Power-up San Diego Naval Hospital

Diego, California, where Westinghouse Panelboards were specified to serve as the vital nerve centers of the hospital electrical distribution system.

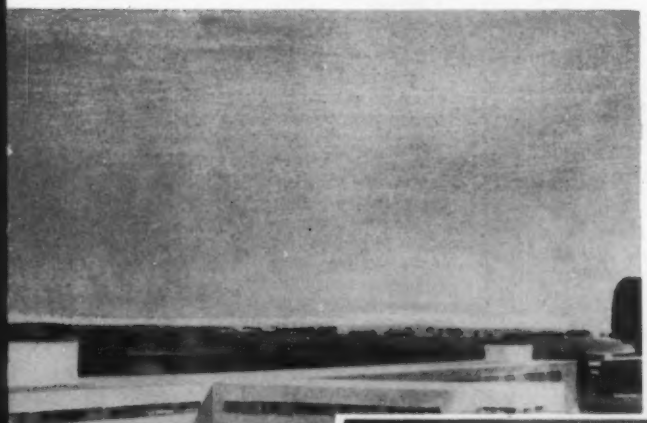
In addition to several Westinghouse switchboards, a total of seven Westinghouse type CDP power distribution panelboards and 64 type NA1B lighting panelboards were installed in the new 1000-bed addition to the naval hospital.

Find out how Westinghouse Panelboards can help you POWER-UP for greater profits; contact your nearby Westinghouse office, or write: Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania. J-93544

United States Naval Hospital, San Diego, California

ARCHITECT-ENGINEERS: Welton Becket and Associates, Los Angeles, California

GENERAL CONTRACTOR: George A. Fuller, Dallas, Texas



Hospital electrician examines Westinghouse NA1B Panelboard on corridor wall. Each of these 64 panelboards controls 40 different hospital lighting circuits.

Architect-Engineers: Welton Becket and Associates

YOU CAN BE SURE...IF IT'S Westinghouse

News about people

Everett F. Cogan, acting secretary-treasurer, **International Association of Electrical Inspectors** since November of 1957, was recently elected to the office of secretary-treasurer by action of the executive council, IAEI.

Mr. Cogan is a native of New Orleans, La. He is an engineering graduate of the University of Detroit and did postgraduate work at Tulane University. Before entering college Mr. Cogan was employed by the Southern Pacific Railroad. He returned as electrician after graduation.

He was an electrical inspector for the City of New Orleans from 1940 until resigning to work as an assistant electrical engineer with the U. S. Bureau of Ships during World War II. He was later made Associate Electrical Engineer. In 1944 he was em-

Everett F. Cogan

ployed by the Consolidated Vultee Aircraft Corporation as an industrial and electrical engineer. With the war's end, he returned to the government's service as an electrical and electronics inspector, War Assets Administration.

In 1946, Mr. Cogan resumed his work with the City of New Orleans as an electrical inspector. Two years later he became assistant electrical engineer with Louisiana Rating and Fire Prevention Bureau. In 1952, he resigned this position to accept the post of technical assistant secretary in the International Office.

The elevation of **John A. Reed** to the position of general sales manager and **John B. Struwe** as manager of the industrial development department signals an accelerated program of sales promotion and industrial development, according to a recent announcement by **E. F. Graham,** executive vice-president of **Southwestern Gas and Electric Co.**

Departments which will function under Mr. Reed include appliance sales promotion, power sales, rural development and lighting. He joined Southwestern in 1942.

A native of Caldwell, Tex., Mr. Struwe received his electrical engineering degree from Texas A & M College. He has been associated with Southwestern since 1946.

Three department heads of **Louisiana Power & Light Company** have been elevated to vice-presidents in the organization. **W. O. Turner,** president, made the announcement following a recent meeting of the board of directors.

They are: **A. E. Elliott,** a director and treasurer of the company; **W. H. Senyard,** director of personnel; and **C. L. Osterberger,** general manager of sales and development.

Mr. Elliott joined LP&L in 1928 as a clerk. He holds a B.A. degree in business administration from Ohio State University. He was named treasurer of the company in 1933.

A native of Pine Bluff, Ark., Mr. Senyard joined LP&L in 1926 as a stenographer. He was named director of personnel in 1929. He is a graduate of the University of Arkansas.

Mr. Osterberger became associated with the company in 1929 in the position of farm service representative. He set up LP&L's first farm program and was named general sales manager in 1937. A graduate of LSU, Mr. Osterberger was acting head of the Agricultural Engineering Department at the University before joining LP&L.

Several recent executive appointments have been announced by **Virginia Electric and Power Co. Erwin H. Will** has been elected chairman of the executive committee and vice-chairman of the company's board of directors, a new position.

A. H. McDowell, Jr., was elected president, succeeding Mr. Will who had served as president of VEPCO since January, 1956, and a director of the company.

Mr. McDowell, a native of Richmond, has been with VEPCO 30 years following his graduation from Virginia Military Institute in 1928, where he received a B.S. degree in civil engineering. After holding various positions in Richmond and Williamsburg, he was made executive assistant to the president in 1946. He became Richmond district manager in 1953 and division manager in 1955. In January 1956, he was promoted to system manager of operations.

Walter J. Matthews, general sales manager of Virginia Electric and Power Company, has been appointed operating manager, and **A. LeRoy Jameson** of Clifton Forge, Alleghany district manager, has been named general sales manager.

Mr. Matthews graduated from Brown University and studied at Massachusetts Institute of Technology. He was associated with several utility companies before joining VEPCO in 1936. He served in varied maintenance and operating positions, as district superintendent in Fredericksburg and Clifton Forge, as district manager in South Boston and Richmond, and most recently as general sales manager.

Mr. Jameson, a native of Alexandria, joined VEPCO in 1924, and has served as district manager in Farmville, Williamston, N. C. and Clifton Forge, as well as local manager of the Portsmouth office of VEPCO.

Arkansas Power and Light Company has announced the appointment of **Paul O. Canady** to the position of executive vice-president of the company. Mr. Canady will assume the duties of his new position on September 1. He succeeds Ralph H. Teed who recently passed away as the result of a heart attack.

Mr. Canaday is a graduate of the University of Tennessee. He was a part-time student engineer for Tennessee Public Service Co., and con-

Paul O. Cannady

tinued on with the company for twelve years, serving in various engineering and management positions.

He was president of the Holston River Electric Co., of Rogersville, Tenn., He served as rate engineer for the City of Knoxville Electric Dept., and from there joined the budget department of Ebasco Services, Inc. He later joined Electric Power and Light Corp., as assistant treasurer and was elected a vice-president.

Mr. Canaday served as assistant treasurer of the United Gas Corp., of Shreveport, La., and is presently a vice-president of Middle South Utilities, Inc.

J. H. Keele

J. H. Keele has been named a vice-president of **Florida Power & Light Company** in charge of sales promotion activities. This action came at a company board of directors meeting following the recent annual meeting of stockholders.

In announcing Mr. Keele's appointment, **Robert H. Fite,** president and general manager, pointed out that under Keele's supervision, the company has several times won top national awards for outstanding performance in promotion of electrical equipment.

Keele started with FPL in merchandise sales in Palatka, Florida, in 1926. In 1927, he was made northern division merchandising manager and retained that position until 1935 when he was promoted to residential sales manager in Miami. Keele, in 1943, was made assistant general sales manager. Since 1951, he has been in charge of sales promotion, supervising statewide activities.

F. D. Spofford, manager of purchasing and stores, has announced the appointment of **Jennings P. Dawson** to the position of purchasing analyst for the **Potomac Edison System.**

Dawson formerly worked as credit manager for the Hagerstown District.

In his new capacity, he will be responsible for a continuing analysis of contracts, plans and agreements under which PE will buy materials and determine the best purchasing policy for the company.

Two **Oklahoma Gas and Electric Company** executives have taken over new key responsibility with the company and another veteran official has retired to accept an important overseas position with an engineering firm.

Taking early retirement to go to Taiwan, Formosa, to help direct a power development program in that country for the J. G. White Engineering Corporation is **Otis Howard,** manager of operations for OG&E.

Ronald F. Danner, formerly manager of engineering and construction,

"Pays to be on the safe side... mirages, you know"

Back in 1945 when we started out in the photoelectric lighting control business, we (too) bent way over backwards in favor of precautions. One such life preserver — time delay — is still around. Although we did and still do supply controls with it, experience has proved that time delay is about as useful as a life preserver in the desert.

Theoretically, time delay is a safeguard against street lights being turned off at night as a result of a lightning flash, car headlight or helicopter tail light. In those early days, when a single control was probably mounted close to the ground and switched hundreds of lights, accidental turn-off was something too horrible even to contemplate. Time delay was supposed to minimize this.

Now, the growing practice of using one control per light, mounting controls higher in the air — and the facts — have convinced us that time delay is an extractable luxury. In those rare cases where a control gets mounted right in line with somebody's beacon or headlights, reorienting a delay-less control a few degrees solves that problem.

As for lightning flashes (one of the more popular "reasons" for time delay) considerable field experience has been accumulated on more than 2000 Fisher-Pierce controls. Some of these controls were a new design with a fraction-of-a-second delay, others were standard design without time delay and built especially for this experiment. Not a single turn-off as a result of a lightning flash has been reported. You might be as surprised as we were to discover that a lightning flash lasts only about 1,000 microseconds and its light intensity, measured at the control, doesn't begin to approach a value great enough (for a long enough time) to trigger a Fisher-Pierce control.

When you tell us to skip time delay, we can give you a control that's simpler, more reliable, easier to install and maintain and that costs less. Caution is one thing, but buying something you don't need is another. The Fisher-Pierce Co., 59 Pearl St., So. Braintree 85, Mass.

FP

FISHER PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

goes into the newly-created post of vice-president, research and development. He is well qualified by both experience and ability for his new assignment.

Mr. Danner has been associated with OG&E since 1921, one year after his graduation from the University of Oklahoma with an electrical engineering degree.

Clarence W. Anthony will retain his present position as executive assistant of operations, but his responsibilities are being greatly increased. Superintendents of engineering, construction transmission - distribution and generation will all report to Mr. Anthony, who in turn, will be responsible to the vice-president and assistant general manager.

A graduate in electrical engineering from the University of Oklahoma, Clarence joined the OG&E in 1935 after working seven years for other organizations in the electric industry, including the Commonwealth Edison Company of Chicago and the General Electric Company in New York.

W. Frazier, midwestern district manager of the **Graybar Electric Co., Inc.,** announces the appointment of **H. M. Bridges** as district operating manager at Kansas City.

Mr. Bridges joined Graybar at Atlanta in 1936 as warehouseman. In 1937 he became a bookkeeper and in 1938, a voucher clerk. From 1941 to 1946 Mr. Bridges was on military leave. Upon his return he became an assistant accountant, and in 1950 was made an accountant. In April 1953 he transferred to Knoxville as operating manager and in 1954 moved to Birmingham in the same capacity, the position held until his present appointment.

Glenn De Kraker has been appointed assistant marketing manager of **Sangamo Electric Co.** His primary responsibility will be the advertising and sales promotion programs applicable to power equipment products. He will also direct the advertising and market research departments, under the supervision of **R. R. Wylie,** marketing manager.

The promotion of **Alvin S. Levine** to the position of manager, lighting sales, has been announced by the **Sola Electric Co.,** of Chicago. Mr. Levine came to the Sola organization in 1949 following his graduation from the University of Illinois. His new responsibilities will cover mercury lamp transformer and fluorescent lamp ballast sales.

Daniel W. Boone has been appointed director of inspector relations of **Federal Pacific Electric Co.,** according to an announcement by **T. M. Cole,** executive vice-president. In his new position, Mr. Boone will work with municipal electrical inspectors in all states east of the Rocky Mountains on common manufacturer-inspector problems.

Daniel W. Boone

He will establish his office at 5745 Peachtree Industrial Blvd., Atlanta, Ga., site of Federal Pacific's new regional manufacturing plant and headquarters of the company's Southeastern Sales Region.

Mr. Boone was formerly an electrical inspector of Atlanta, Ga. He worked in the city's electrical inspection department for twenty-three years.

The Penn-Union Electric Corp., of Erie, Pa., has announced the appointments of **Fred T. Conboy** as vice-president of sales, and **Morris Brenner** as vice-president of engineering.

Prior to Mr. Conboy's appointment, he held the position of sales manager. His service with Penn-Union dates back to 1936.

Mr. Brenner jointed Penn-Union in 1956. Before this he was associated with Burndy Corporation.

Ernie A. Schmidt, midwest regional sales manager, has been elected commercial vice-president of **I-T-E Circuit Breaker Co.,** of Philadelphia. In this position Mr. Schmidt will render valuable assistance in the establishment of company sales policies as well as continuing his duties as midwest regional sales manager.

Mr. Schmidt attended Milwaukee School of Engineering and the University of Wisconsin. He then was associated with several consulting firms in the industrial and utility construction fields. He joined I-T-E in 1936 as application and sales engineer.

Pennsylvania Transformer Division, McGraw-Edison Company has announced the appointment of **W. Walter Renberg** as assistant sales manager.

Mr. Renberg has been associated with Pennsylvania Transformer since 1947. He moves to sales from the engineering department, after serving for several years as technical product leader in charge of shell-form power transformers. His first position with the company was as an electrical design engineer.

Mr. Renberg is a graduate of Carnegie Institute of Technology, where he obtained an electrical engineering degree.

J. E. Goff, vice-president, of **Ceilheat, Inc.,** has announced that Jack Witherspoon, Jr., has joined the company as chief engineer in charge of design. Ceilheat, Inc., whose complete manufacturing facilities are located in Knoxville, is a leading producer of electric heating equipment.

Mr. Witherspoon graduated from Vanderbilt University. He was previously associated with the design engineering department of General Electric and was chief project engineer of the Original Equipment Division of Robertshaw Fulton Controls Co.

John J. Klosin has been appointed manager of the Utility Division of The **Thomas & Betts Co.,** manufacturer of electrical connectors and electrical hardware.

Formerly product manager of the division, Mr. Klosin now is in charge of all utility sales and engineering.

John J. Klosin

He joined Thomas & Betts in 1952 following service in the electrical manufacturing industry as field engineer and sales engineer. He is a graduate of Catholic University and is a mechanical engineer.

Lee Francis, who has been associated with **Union Insulating Co.,** of Parkersburg, West Virginia, for the past fifteen years, has been transferred to Atlanta as Southeastern District sales representative.

Mr. Francis will work out of Atlanta under the direction of **Clyde R. Palmer,** Southeastern District manager for Union Insulating Co.

Technical books

Heat transfer

"The Use of Analogs and Analog Computers in Heat Transfer," by M. Tribus. Published by Engineering Experiment Station, Oklahoma State University, Stillwater, Okla., 84 pages, $2.50.

This timely publication deals with the various analogs useful in the discussion and solution of heat transfer problems. In addition to a discussion of analogs and equation solvers, net work analogs, computers, and electronic differential analyzers are discussed.

Examples of solutions of heat transfer problems together with an analysis of the errors and sources of errors in such equipment are included.

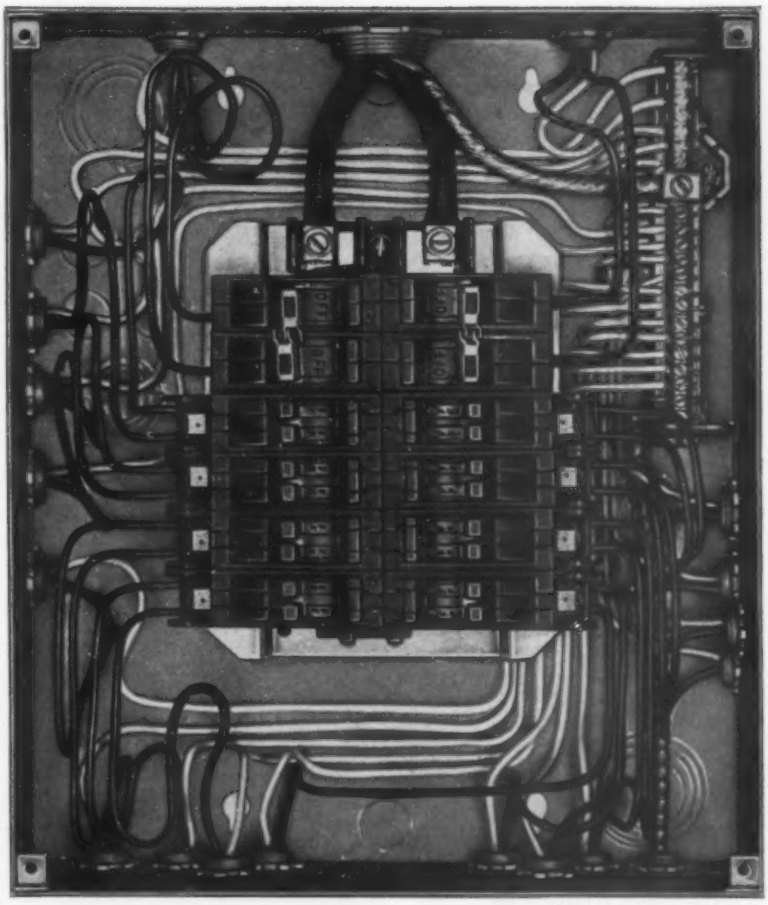
Science of graphics

"Graphic Science: Engineering Drawing, Descriptive Geometry, and Graphics," by Thomas E. French and Charles J. Vierck. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y., 758 pages, illustrated, $8.50.

This outstanding new book is aimed at a complete understanding of graphical methods as they relate to the problems of the engineer, not to the problems of the draftsman. In this way the engineer becomes more competent to specify the graphical procedures used in accomplishing engineering work of a wide variety.

The three core subjects in drawing have been successfully combined in one volume. The focus throughout is on drawing as a tool for the engineer. In emphasizing the *science of graphics* the practical trade aspects, or *art* of graphics are minimized. This means that subjects such as jigs and fixtures, gears and cams, architectural and structural drawing, etc. have been omitted, and in their stead is a complete coverage of descriptive geometry—points, lines, planes, intersections, curved lines, and curved and warped surfaces.

Photograpic illustrations are used extensively not only to dress up the book but to help in explaining fundamentals, especially in descriptive geometry. Each chapter has a *mast head* or *photomural* which is intended to intrigue the reader with the interesting possibilities of the discussion to follow. Photographs, pictorial drawings, and orthographic drawings are mixed in the presentation of theory and practice.



In this 20-circuit installation

CATALOG NUMBER TRP1210F,S

G.E.'s new "twin" breaker saves you $11.10*!

HERE'S HOW YOU SAVE:

Needed:
2 Two-pole breakers
16 Single pole breakers
Total 20 Poles

120/240 VOLTS AC 1Φ, 3W

$79.90* G-E "TWIN"† WAY	$91.00* OLD WAY

*You save $11.10**

This is just one example—we could cite dozens. Do your next job the "twin" way . . . put more circuits into smaller load centers . . . save up to 25% in equipment costs! General Electric Company, Circuit Protective Devices Department, Plainville, Connecticut.

Two rugged breakers in a one-inch case

Steel lugs on all terminals • Silver-plated current-carrying parts • Thermal magnetic trips • Self-aligning enclosed stab receptacle • Rated 15-20, 15-15, 20-20 amperes.

*LIST †TRADE MARK

In cost and quality, you win with the "twin"!

GENERAL ELECTRIC

New products

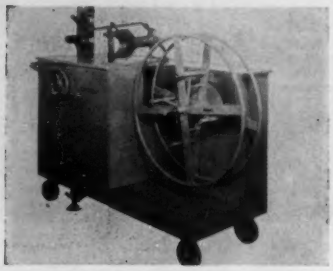
Portable "shop" cuts, carries and measures wire and cable

A PORTABLE "shop on wheels" to perform all necessary functions in processing telephone and electrical wire and cable is now being manufactured by Suttle Equipment Corp., 135 South La Salle St., Chicago 3, Ill.

Called the Cablecart, this versatile unit can be used for transporting, cutting, measuring, coiling, and handling wire and cable. One man can easily move the Cablecart about a shop.

Cablecart components include a 5-digit Veeder-Root measuring meter with a 2½-inch outside diameter capacity (up to 750,000 cm). The all-position, five-ton hydraulic cutter has a 3½-inch outside diameter capacity.

Two foot-lock truck stops are included for firm positioning. The unit also has sprocket gear and chain drive to operate the two-piece take-up, pay-out reel. A control wheel to



operate the reel is fixed on each side of the Cablecart. The Suttle "shop" is five feet long, 42 inches high and 27 inches wide.

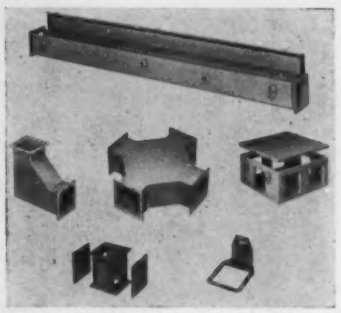
For additional data, ask for item P-714, using the coupon on page 113.

Liquid-tight wireways and fittings designed

DEVELOPMENT of a complete line of liquid-tight "JIC" flanged hinged-latched-cover wireways and auxiliary fittings is announced by Keystone Manufacturing Co., 23328 Sherwood, Warren, Mich.

These new "JIC" wireways and fittings are designed and built for use on wiring installations which require special protection against oil, dirt, dust and water. They are made of 14 gauge sheet steel with 11 gauge steel flanges seam welded to the ends of each section. The hinged covers and the ends of the wireways are fitted with positive sealing neoprene gaskets and external latching type clamps to assure a continuous liquid-tight installation.

Flanged hinged-latched-cover wireways are offered in four standard sizes—2½" x 2½", 4" x 4", 6" x 6" and 8" x 8"—all available in 1 through 5-feet lengths. Fittings include T fittings and pull boxes, 90°, 45°, 22½°, and 7½° elbows; square and cross pull boxes, nipples and junction boxes. Reducing bushings,



trough collars, gaskets, drop and bracket hangers and closing plates are also available in corresponding sizes.

For additional data, ask for item P-715, using the coupon on page 113.

Lumenated ceiling eliminates shadows

THE LOW COST Lumenated ceiling now being offered by Thermotank, Inc., 3000 E. Woodbridge St., Detroit 7, Mich., diffuses light uniformly from wall to wall without glare, shadows, or high spots. It streamlines the ceiling by concealing pipes, air conditioning ducts, conduits, sprinkler heads, etc. Yet, each utility is easily accessible for maintenance.

The Lumenated ceiling consists of continuous rows of corrugated vinyl plastic sheets supported by an aluminum framework beneath a structural ceiling. The light weight and flexibility of design permit economical and simple installation in either new or remodeled interiors.

For additional data, ask for item P-716, using the coupon on page 113.

Sealing compound poured when connector installed

THE TYPE CGBS cord connectors manufactured by Crouse-Hinds Co., of Syracuse, N. Y., provides for sealing the cord on portable equipment for use in hazardous locations.

Crouse-Hinds sealing compound is poured when the connector is installed. A wire ring holds the cord in the compound, which hardens to create an effective seal.

The clamping nut has an integral cord clamp which insures positive locking action on the portable cord, preventing accidental withdrawal from the connector. The connector is

available in sizes to fit cord from ¼" to 1 3/32" in diameter.

For additional data, ask for item P-717, using the coupon on page 113.

Heavy-duty snap-on straps have two-rib reinforcements

A NEW LINE of heavy duty one-hole snap-on conduit pipe straps with two-rib reinforcement has been announced by Gedney Electric Co. 1270 Sixth Ave., New York 20, N. Y.

The snap-on straps, made of hot-dipped galvanized steel, are available in types for EMT and rigid conduit. Every strap is stamped with size and type. The two-rib design makes for positive contact and holding power.

Rigid-type straps are made in sizes from ½ inch to 4 inch. EMT straps are made in sizes from ½ inch to 2 inch.

For additional data, ask for item P-718, using the coupon on page 113.

Low-voltage switches control from one to six currents

A NEW LINE of low-voltage switches designed to provide easier installation and greater versatility in placement is available from the Touch-Plate Manufacturing Corp., P. O. Box 1970, Long Beach, Calif.

Series 50 switches which can control from one to six electrical currents are all designed to mount to a single gang box or switch plaster ring.

An outstanding feature of the new series is its half-inch depth, allowing versatile use of switches—it can be installed in a sliding door pocket and in other limited locations.

For additional data, ask for item P-719, using the coupon on page 113.

Brushless a-c generator is spark free, close coupled

A COMPLETE LINE of 50, 60, and 400 cycle brushless alternating current generators has been developed by Kato Engineering Co., Mankato, Minn.

These machines are available in

both single and three phase output with all standard commercial voltages available throughout the range of sizes offered in brush type alternators. The 60 cycle, three phase sizes extend from 5 to 400 kw and 400 cycle from 1 to 250 kw, revolving field types in all standard commercial voltages through 600 volts. Some sizes are available in the higher voltages of 2300 or 4160 volts.

These brushless, "Spark Free" generators are available in single bearing and two bearing close coupled design for direct connection to industrial engines and can be supplied in standard two bearing design for belt drive applications.

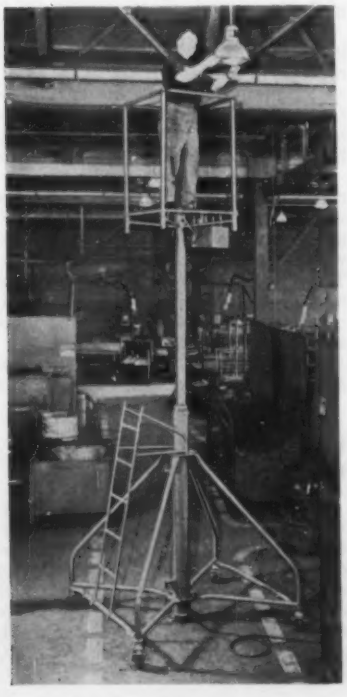
For additional data, ask for item P-720, using the coupon on page 113.

Hydraulic one-man work tower telescopes in two directions

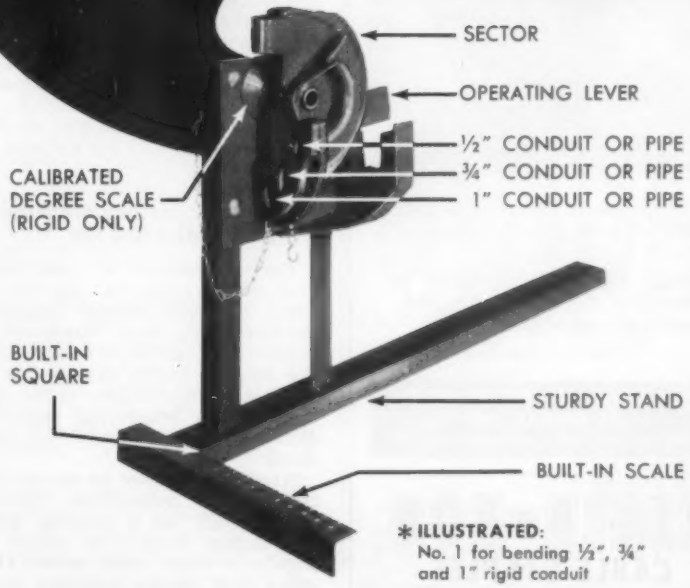
SAFWAY STEEL Products, Inc., 6234 W. State St., Milwaukee 13, Wis., has announced improvement of its Moto-Lift work tower. Raised hydraulically, the Safeway Moto-Lift is now available with two types of pump motors for either plug-in or self-contained operation.

As redesigned, the Moto-Lift will pass through any standard 6 ft. 8 in. high doorway or into most elevators when telescoped in height. This is done by lowering the work platform and pulling lock pins to permit dropping the four guard rail posts down through their sockets.

The Moto-Lift can also telescope in width. The stable, four-legged base—61 x 61 in. when locked in the working position—can be folded to 30 x



BEND CONDUIT EASILY and ACCURATELY with a real on-the-job tool!



* ILLUSTRATED: No. 1 for bending ½", ¾" and 1" rigid conduit

RUGGED...PORTABLE...SIMPLIFIED

These are complete machines of all steel construction and their light weight (*66 lbs. including stand) make them a real on-the-job tool. There are no loose parts to be misplaced or lost and the only maintenance is an occasional drop of oil. You get accurate bends every time . . . no strain, slipping or loose parts to worry about. Benders work equally well on aluminum or steel conduit. Ask the electrician who is using one; he will tell you it's the finest tool available and at a price that is eminently reasonable.

BENDING CIRCLES: INSIDE RADIUS

	No. 1	No. 1T
½" conduit or pipe	2"	EMT 3"
¾" conduit or pipe	4¼"	EMT 4½"
1" conduit or pipe	5¾"	EMT 6½"
	No. 2	**No. 2T**
1¼" conduit or pipe	7¼"	EMT 9½"
1½" conduit or pipe	8¾"	EMT 10½"

Write for FREE Illustrated Folder on How to Bend Conduit

LIDSEEN OF NORTH CAROLINA, INC.

1020 FIRST STREET, HAYESVILLE, NORTH CAROLINA

PHONE HAYESVILLE 2000

OSMOSE
INSPECTION & TREATING
Can SAVE this Pole!

For a few dollars, Osmose can treat this pole at the groundline area and SAVE it for many, many years. For a 16-page fully descriptive booklet of this money-saving idea, send post-card or letter to us.

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Towson, Md.	Roy J. Buress
Richmond, Va.	Arthur C. Hoey

Other Territories Still Open

KING MFG. CO. INC., JAFFREY, N.H.

80 in. This makes it easy to roll the Moto-Lift along narrow aisles, between machines or other equipment, through doorways and into elevators.

To fold the base, it is only necessary to lift off the ladder used for reaching the platform, and pull out locking pins on the two horizontal leg braces.

To improve operation and minimize maintenance, a direct-acting, full length hydraulic ram is used to elevate the work platform in place of the former short ram with pulley-and-cable arrangement.

Despite the lower telescoped height, the maximum platform extension remains at 17 ft. This elevation permits any average size man to work comfortably on equipment as high as 23 to 24 ft. above the floor, reaching a big majority of overhead jobs.

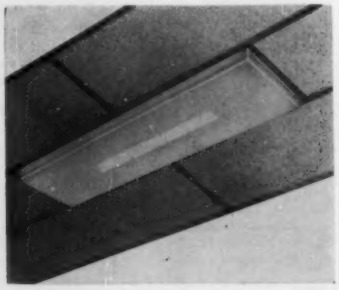
For additional data, ask for item P-721, using the coupon on page 113.

Recessed or surface mounted troffer handles like tile

THE DEVELOPMENT of a new troffer that recesses (only 1⅜", less than the depth of most ceiling supporting members) has been announced by Smithcraft Lighting, Chelsea, Mass. The Slendex troffer handles like tile and is a practical answer to the minimum cavity, low-ceiling conditions dictated by today's construction economies.

Slendex is shielded by an extruded and formed polystyrene diffusing panel, which has a pleasing, glare-free surface finish. The panel's triangular inverted center section eliminates dark streaks. Diffusing panels swing open easily and are entirely removed without tools by simply lifting off.

Because the Smithcraft Slendex troffer requires a minimum of space behind the ceiling, it provides new freedom for the installation and main-



tenance of duct-work, air conditioning, wiring, and all other utilities. Easily installed by one man, Slendex recessed units are quickly placed into the ceiling flat, with no wasted time or effort.

Slendex is also available as surface units. Slim, trim and also shallow, they provide architecturally pleasing and high quality lighting for today's modern interiors. The fixture is only 1⅜" deep; overall depth, including shielding, is only 3". All Slendex units, both recessed and surface, are available in 1' and 4' units for 2 Rapid-start lamps, and 2' x 4' units for 4 Rapid-start lamps.

For additional data, ask for item P-722, using the coupon on page 113.

Manufacturer redesigns household light bulbs

A NATIONWIDE sales campaign built around the first change in the styling and design of standard household light bulbs in more than a quarter of a century, was announced early in July by the Westinghouse lamp division.

The new Westinghouse incandescent light bulb represents a basic departure from the ordinary light bulb to which the public has long been accustomed.

The new functional styling permits important improvements in construction which result in superior illumination, the manufacturer reports.

Known as the "all new Eye Saving white" bulb, the new lamp has a special electrostatic silica coating on the

interior surface. The glare and "hot spot" of the ordinary light bulb has been eliminated.

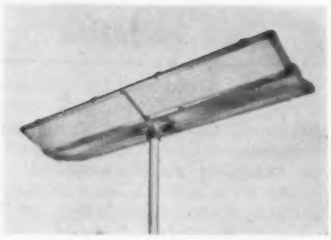
The new Eye Saving bulbs have been thoroughly tested in selective marketing areas. They will be available on a nationwide scale during the fall and winter months. Prices will be less than those charged for Westinghouse Beauty Tone tinted light bulbs.

The new light bulbs will be merchandised initially in the 60 and 100 watt sizes. A whole new line of merchandising and point of sale material will accompany the Eye Saving line. This includes self-displaying shipping cartons, prepacked display assortments, merchandiser conversion signs, and illuminated demonstrators.

For additional data, ask for item P-723, using the coupon on page 113.

VHO and SHO lamps operate fluorescent island lighter

REVERE ELECTRIC Mfg. Co., 7420 Lehigh Ave., Chicago 31, Ill., is now offering a new, all-aluminum fluorescent service station island lighter especially designed to operate most efficiently with VHO or SHO lamps. Four such lamps provide approximately 40% more light than six HO lamps.



Light chambers of Revere's new island lighter are tilted at a 20° angle to provide greater light distribution, more attractive appearance, and greater visibility from the street. The light chambers are separate from the center channel in which the transformers are housed. Air circulates freely between the light chambers and the center channel, dissipating the heat generated by the transformers. This provides cooler operation and increased life for the transformers.

The new Revere island lighter is produced in 4-, 6-, and 8-foot lengths, completely wired, ready to mount on the pole. Luminaires can be easily combined by removing end plates and bolting the units together, making it possible to meet requirements for different lengths.

For additional data, ask for item P-724, using the coupon on page 113.

Interchangeable conduit hubs on new raintight enclosures

RAINTIGHT, NEMA Type 3R enclosures with interchangeable conduit hubs are now available for all 60-ampere series connected and 100-ampere parallel connected fuse puller panels manufactured by the Circuit Protective Devices Dept., General Electric Co., Plainville, Conn.

The new series-connected panels are rated 60-amperes, 120/240-volts a-c, single-phase, three-wire. They are available with an extra puller and up to 12 plug fuse branch circuits.

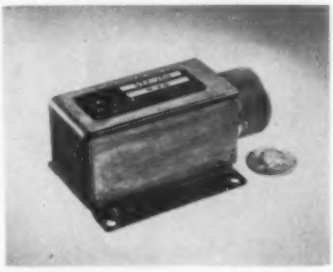
Neutral provisions include both insulated groundable and grounded.

All parallel-connected panels are rated 100-amperes, 120/240-volts a-c, single-phase, three-wire, and are available with up to four pullers and provision for 4 to 12 plug fuse branch circuits. All parallel panels have grounded neutrals.

For additional data, ask for item P-725, using the coupon on page 113.

Phase sequence relay has fail-safe contact

A PHASE SEQUENCE relay which senses the phase sequence of a three phase power supply, and operates to close a contact when the applied phase sequence is A-B-C, is now



manufactured by Master Specialties Co., 956 E. 108th St., Los Angeles, Calif. The unit is fail-safe because the relay contact is normally open. The relay will not operate when any lead, or any combination of loads, are open and/or grounded. The contact is also open when the phase sequence is A-B-C.

This ten ounce relay was designed in accordance with military specifications, and for use under severe environmental conditions. Static components, except the relay contact, insure maximum dependability.

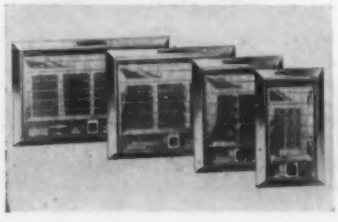
For additional data, ask for item P-726, using the coupon on page 113.

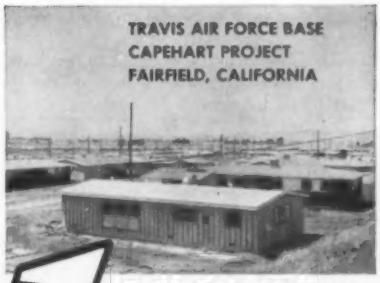
Built-in wall heaters available in four sizes

BUILT-IN heavy duty double-pole thermostats and lifetime stainless steel reflectors, are two features of a new line of flush-type electric wall heaters being introduced by Swan Mfg. Co., of Vancouver, Washington.

Vecto-ray wall heater features include: Highest grade nickel chrome elements mounted at the front of large size ceramics, and attractively designed grill that lifts up and out for easy cleaning.

Heat loss at the back is virtually eliminated, claim the manufacturers, through the use of stainless steel re-





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GOES UP "FAST".....
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can SAVE
on your
NEXT JOB!

UNION INSULATING CO.
Parkersburg, West Va.

flectors and reflective paint on the inside of the can.

Frames are finished in beige hammertone baked enamel which can be painted to match any room decor. The heaters run completely silent and are said to require no maintenance. Wiring compartments shield all electrical connections to prevent danger of shock.

Vecto-ray radiant wall heaters are available in four sizes ranging in width from 9⅜ in. to 28⅛ in., and from 1000 to 4000 watts. All heaters are 18 in. high and 4 in. deep.

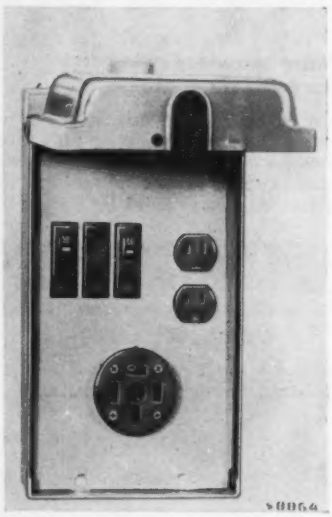
For additional data, ask for item P-727, using the coupon on page 113.

Four-wire power outlet for outdoor construction

AN ALL-PURPOSE, 4-wire power outlet has just been introduced by Midwest Electric Products, Inc., Box 156, Mankato, Minn., designed for use especially by mobile home parks, outdoor construction, farms and ranches.

Model P-55-C has a 50 ampere 250 volt 4-wire power receptacle and is protected with a two pole 50 ampere circuit breaker. It also has a grounded-type duplex receptacle protected with a one pole 20 amp circuit breaker. The top hub and bottom K O's facilitate overhead or underground connections.

Completely weatherproof and tamperproof as well, cover closes completely when in use and can be padlocked. Seventy other standard



models are manufactured in fused and circuit breaker types with 15 to 50 amp, 3 and 4 wire receptacles.

For additional data, ask for item P-728, using the coupon on page 113.

NOW — AN ENTIRELY NEW CONCEPT IN

watertight

service entrance

connectors

THIS exclusive M&W fitting introduces a new high in simplified installation. The hex-nut casting compresses the neoprene gland *directly into the hub* of the meter socket. This permits a faster, easier installation. The conical metal sleeve gives ample take-up around the cable, prevents cable-twisting, and makes a more adequate seal with neater appearance.

New HNS-23 M&W Connectors save time, cut costs, provide ONE connector to handle ALL sizes of 100-amp rated cable. Write today for sample fitting, prices and details.

Non-Water-Tight Connectors — Ground Clamps — Service Entrance Mast Kits — Service Entrance Caps, Straps and Sill Plates — BX and Romex Connectors

Patent Applied For
EXPLODED VIEW
shows hex-nut casting which compresses into threaded meter hub.
INSTALLED VIEW
A neater, water-tight seal at lower cost.

M&W Electrical Fittings

The M. & W. ELECTRIC MFG. CO., Inc.

EAST PALESTINE, OHIO

Free bulletins

Features, ratings, and dimensions of single-row, three-row and cluster-type **capacitor rack assemblies** are outlined in a new bulletin available from **Line Material Industries,** 700 W. Michigan, Milwaukee 1, Wis.

For additional data, ask for item B-729, using the coupon on page 113.

R. E. Uptegraff Manufacturing Company has made available a new technical bulletin on their line of **pole-type distribution transformers.**

For additional data, ask for item B-730, using the coupon on page 113.

A colorful catalog of their 1958 **residential lighting fixture line** has been released by **Markel Electric Products, Inc.,** 145 Senaca St., Buffalo 3, N. Y.

For additional data, ask for item B-731, using the coupon on page 113.

Detailed descriptions, ratings and characteristics, performance data, weights and dimensions, standard and optional accessories, of RM **(repetitive manufacture) medium transformers** are contained in a graphically illustrated bulletin recently published by the **General Electric Co.,** Schenectady 5, N. Y.

For additional data, ask for item B-732, using the coupon on page 113.

A new **fluorescent lamp ballast** data booklet is being offered by **Advance Transformer Co.,** 2950 N. Western Ave., Chicago 18, Ill.

For additional data, ask for item B-733, using the coupon on page 113.

An instruction manual and cost guide available from **TeVco Insulated Wire,** 108 Prospect Ave., Burbank, Calif., shows in a photographic story, the step by step procedure for an electrical contractor to wire a residential home with numerous **convenient TV plug-in wall outlets.** With this wiring system, full strength TV antenna signal is instantly available for the TV set or sets in many strategic locations throughout the home.

For additional data, ask for item B-734, using the coupon on page 113.

Operation of a combined **light and air diffusing troffer** called Paraflo, is graphically explained in a folder available from **Day Brite Lighting, Inc.,** 6260 N. Broadway, St. Louis 15, Mo.

For additional data, ask for item B-735, using the coupon on page 113.

The Adalet Manufacturing Co., 14300 Lorain Ave., Cleveland 11, Ohio, combined into a sixteen-page bulletin, selection and specification data for their extensive line of **cast-aluminum** weather-proof and explosion-proof **housings.**

For additional data, ask for item B-736, using the coupon on page 113.

The latest edition of **"Your Guide to NEMA Standards Publications"**—a 17-page booklet describing 150 Standards Publications developed by Subdivisions of the **National Electrical Manufacturers Association** is now available from the association's headquarters, 155 East 44th Street, New York 17, N. Y.

For additional data, ask for item B-737, using the coupon on page 113.

A manual for planning **electric heating systems** for rooms, complete homes and buildings is available from **Markel and LaSalle Products,** 145 Senaca St., Buffalo 3, N. Y. All the necessary information to accurately determine the size, type and placement of electric space heating equipment, and to provide an accurate forecast of yearly operating costs for residential, light commercial, and industrial applications is contained.

For additional data, ask for item B-738, using the coupon on page 113.

A new line of extremely **shallow surface mounted luminaires,** less than three inches deep, is featured in an eight-page two-color bulletin available from **Pittsburgh Reflector Co.,** 405 Oliver Bldg., Pittsburgh 22, Pa.

For additional data, ask for item B-739, using the coupon on page 113.

Some of the research facilities for the company's wide line of **transformers** along with their design and construction features are described in a new bulletin released by **Allis-Chalmers Manufacturing Co.,** 938 South 70th St., Milwaukee 1, Wis. Covered are power, unit substation, secondary network, industrial application, furnace, distribution, and instrument transformers.

For additional data, ask for item B-740, using the coupon on page 113.

Air-conditioning

(Continued from page 29)

Duncan commented: "If we'd had to fish wire on this job, we'd have been working way past the opening of the season."

Seaboard owners Frank Pilleggi, Fred Seelmann, Jr., and foreman Seals Fagan all agreed that the "lay-in system proved very satisfactory and also helped us keep on schedule."

The extensive electrical renovation of the Palm Beach Biltmore Hotel was started on September 1, 1957, and was completed on schedule by mid-December.

Know the law

(Continued from page 72)

to be remembered that most courts seem to declare that liability for injuries to third persons when it could have been foreseen that some one might be innocently exposed to the dangerous condition left by the contractor.

As decided by the court in this case, this is specially so when the owner or occupant who has the wiring done has no reason to suppose that the work is being left in dangerous condition.

Rotating discs

(Continued from page 27)

removed from the palace and offered for public sale.

W. J. Garrison, estimator for Britain Electric Co., says that the Rice Hotel is a pioneer in the use of the lighting system using rotating discs and selsyn motors. Although there are a few other such installations in large cities, this is one of the first to be used in a Southern hotel.

Tunnel approach

(Continued from page 38)

or terminates, pole spacing has been carefully graduated to provide time for the motorist's eyes to become acclimated to the changing condition. When traveling at speeds up to 60 mph, sudden plunges into darkness or light constitute significant hazards to motorists.

Time switches controlled by astronomic time clocks regulate operation of the roadway lighting system, and control circuits have been arranged to allow for future installation of photoelectric controls.

Power for operation of the lighting system comes from ventilation buildings located at either end of the harbor tunnel. According to the lighting designer, this permits operation of roadway lighting at low power rates. Power is channelled into the ventilation buildings from four separate feeder loops, thereby assuring reliability of service. Use of the ventilation

BUCHANAN Nylon Insulators, with internal metallic locking rings, snap securely and permanently over Buchanan Splice Caps. Easily and quickly installed even in extremely cold weather — even on flexible wire.

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buildings as the power source also makes possible control of the entire lighting system from two central points.

Luminaires are mounted by integral slipfitter brackets on tapered, davit-type metal poles which harmonize with the modern appearance of the $130,000,000 tunnel and roadway system. To provide maximum efficiency of light distribution, luminaires are mounted at a height of 30 feet and at an upward angle of 25 degrees.

In addition to the highway lighting luminaires, GE has also supplied 73 Fluoroflood fixtures for 28 highway guide signs along the approaches to provide optimum viewing for nighttime motorists.

Pushbutton console

(Continued from page 32)

ing system heats each of three offices in the building, and Webster's Teletalk System aids in communication from one area to another.

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Cashing in on heavy-ups

(Continued from page 36)

gineer is usually dispatched to check, and a permit issued by the District authorities to carry through.

We maintain wiring on the old service until the changeover is made. Old systems in the District are usually a No. 14 wire or 15-ampere service. We can go up to a 100-, 160-, or 200-ampere service in this area. While 100- or 160-amperes are adequate on existing service entrance cable, we recommend 200 amperes where a customer is likely to add new appliances, and has the ability to pay. We point out that there is little difference between 160 and 200 amperes in installation cost, and that such service will take care of all appliances in the home at the present time, plus air conditioning.

After the load center has been mounted, current is restored to existing installation. A temporary tap is taken from the old service and equipment, like a freezer or refrigerator, is taken care of to avoid loss. The old installation stays in until the new and permanent one is completed.

We carry no more than a $2,000 inventory of materials, like load centers, ground materials, cable, junction boxes, lumber to mount the load center on, and incidental fittings. We usually buy these supplies as we need them.

If the old service has to be torn out before the new one put in, service is then temporarily suspended. If the old service does not have to be torn out, then current is continuous.

Rewiring and changeovers generally present no electrical problems. Sometimes mechanical problems appear, however, as in an instance where recreation room panels around an electric box had to be cut. But we managed to do a neat job after reconstructing the panelling.

If we contractors were to do the educational job which areas like Washington require with their outmoded residences, we could keep staffs of mechanics busy for the next 10 years. Figures recently furnished by the local Electric Institute indicate that sales volume in appliances in '57 exceeded '56 in practically every category. The gain should be significant to us.

A good promotional job was done by the power company last year on the need to rewire for modern living, and another such campaign may be forthcoming this year.

If we can follow-up with an educational program in the homes we will have a steady volume of profitable work for some time to come.

Relaying conference

(Continued from page 56)

computers in the electric power field, presented by Dr. W. J. McKune, professor of electrical engineering, Georgia Tech., who pointed out that the basic differences between analog computers and digital computers were such that engineers should be especially alert to the effect of errors and approximations.

In referring to a power system model set up on an a-c network calculator, he said: "For balanced conditions this model is almost a one-to-one model which each electrical quantity in the system is represented by a similar electrical quantity. We recognize that such models are inexact — transmission line impedances are approximate, machine impedances are known not to be linear, etc. However, the engineer can evaluate the effect of these approximations since his model is quite familiar and he is aware of the inexactness and its degree.

"When a solution is obtained from a digital computer, a different sort of model is used — a purely mathematical one. This model may be very good or it may be very poor. The quality of this model will depend on the complexity of the problem, the mathematical manipulative equipment available, the degree of exactness required of the solution and the analytical ability of the person setting up the model. It is the manipulative abilities of the digital computer which makes it so adaptable to complex problems.

"After a satisfactory compromise is reached between the accuracy desired and the complexity of model, the next step in the solution to an engineering problem on a digital computer is to establish methods for solving the equations. This requires a basic knowledge of numerical analysis. The determination of such basic quantities as the square root or the trigonometric quantities will involve the use of series. These series must, of necessity, contain a finite number of terms. The choice of the number of terms to be used may be a compromise between accuracy and speed of solution."

The digital computer is, without doubt, he concluded, a very powerful tool in the analysis of systems, but the user should be cautious in his interpretation of the results.

Mutual coupling

The relaying problems that arise as the result of mutual coupling between transmission lines was discussed by William G. Rankin, Jr., Virginia Electric and Power Co. In this particular instance, the coupling effect was being experienced on 230 kv and 110 kv lines carried parallel on the same right-of-way.

As a result of his company's experience with this problem, Mr. Rankin arrived at the following conclusions:

"Mutual coupling generally can be neglected when the parallel lines are bussed at both ends provided the ground relay settings are not very sensitive.

"Mutual coupling should be considered when the parallel lines are of different voltages.

"Mutual coupling can cause tertiary reversal in auto-transformers and neutral reversal in wye-delta transformers.

"The errors in fault current data obtained from the D.C. calculating board neglecting mutual coupling were found to be greater during conditions of abnormal switching than during system normal."

J. L. Thompson, of Tennessee Valley Authority, presented a very interesting and practical discussion of methods of determining whether relays are connected correctly.

"Correct connections," he said, "start with correct drawings. Connections to various types or models of relays have been standardized on TVA drawings. The same is true of instrument transformers. They always have the same relative polarity between primary and secondary connections. Another aid is the fact that the phase A relay is always on the left or top facing the front of the switchboard, the phase B relay is in the middle, and the phase C relay is on the right or bottom.

"TVA's engineering organization always makes up complete elementary or schematic diagrams of all relay installations. Most of these diagrams show stud numbers, and on many occasions these will be the only prints that the test engineer will use. The test engineer checks the elementary or schematic diagram for correctness of the overall scheme. Other prints, such as wiring diagrams, also are useful to the test engineer, particularly dur-

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Wanted: Manuscripts for publication

The editors of Electrical South will welcome contributions from the field for publication. Electrical contractors, consulting electrical engineers, light and power company engineers, and others closely associated with the electrical industry are invited to submit articles, photographs, and drawings relating to important and interesting electrical projects in South and Southwest.

Articles are wanted in two principal classifications:

Wiring and Lighting: **Articles on interesting and unusual electrical installations; any phase of electrical contracting such as business promotion, estimating, handling men and materials, etc.**

Utility Engineering: **Articles relating to any phase of transmission, distribution, and metering, including design, installation, testing, and maintenance. These articles should be "by-line" articles carrying the name of a Southern or Southwestern light and power company.**

All articles will be given careful consideration and payment will be made promptly for all material accepted for publication.

Address all communications to the editor:

Electrical South, 806 Peachtree, Atlanta 8, Ga.

ing initial tests on new or modified installations.

"There is only one way to check wiring, and that is to check each wire against the drawings and to take nothing for granted. This is done initially and on every change in wiring. To assure correct drawing, field print revisions are made by field test engineers to correct any drawing errors or to show deviation from original design.

"The test engineer should be cognizant of the correct number and location of grounds on secondary wiring and should check carefully to see that they are applied correctly."

"Inflation and automation have caused us to take another look at our automatic reclosing practices," reported R. J. Cooper, of Georgia Power Co., in a talk on reclosing practices. "There are strict demands for uninterrupted service unheard of until recent years by some of our customers, due to improved automatic type manufacturing processes. If we expect to supply satisfactory service to these customers, every economical means for its improvement must be used. This includes fast tripping during faults to prevent excessive permanent damage and fast restoration or reclosing as soon as the fault is removed to shorten interruptions.

"Our restorative schemes are just as important as our schemes for interrupting faults. We spend a great deal of time and money in our protective relaying schemes. We worry about coordination and selectivity and do an excellent job getting breakers opened — now what about getting them reclosed?

"Almost everyone has gone beyond the point of just applying automatic reclosing to radial type circuits. We now put reclosers on multi-terminal interconnecting lines, transformer bank breakers and station busses or any place that they can be used to tie the system back together, restore service or save a busy operator's time."

Protecting transformers

High speed relaying for transformer banks was the subject of a paper presented jointly by R. L. Sharp and W. E. Rich, both of Westinghouse Electric Corp.

"High-speed relays for transformers are becoming more necessary with the advance of high-speed breakers and high-speed line relays. To maintain system stability, it is necessary to isolate faulty equipment as soon as practical. Faults in the transformer windings and connections not only can cause severe damage to expensive equipment but also can affect system stability. Various relays are available to the relay engineer that will operate to isolate the transformer from a system in approximately one cycle," reported the authors.

"The principal protection which is recommended for a transformer is to compare the incoming and outgoing currents. This is the principle of differential relaying which will operate on all types of faults in the protective zone. For those transformers with a gas cushion at the top of the oil, a sudden-pressure relay can sometimes be used to supplement the differential relay. The sudden-pressure relay operates on the rate of rise of the gas pressure in the transformer tank upon the occurrence of a fault in the winding below the surface of the oil. This type of relay will not operate for faults above the oil level of the transformer."

The authors also discussed such applications as voltage-inrush tripping-suppressor relays, harmonic-restraint relays, etc.

One of the high points of the conference was the concluding afternoon session devoted to a panel discussion of relaying under abnormal conditions. Discussions of the subject were first presented by C. C. Jones and J. Vandegrift, both of Alabama Power Co. Their presentations were followed by discussions presented by T. B. Chapman, of Memphis Light, Gas and Water Division; W. N. Taylor, Duke Power Co.; Henry Markel (for A. J. Bartlett), of New Orleans Public Service, Inc.; A. L. Lipson, Virginia Electric and Power Co.; and W. E. Coe, Florida Power and Light Co.

Extra high voltage

(Continued from page 50)

and dispatching of the EHV system to Western Massachusetts Electric.

After 1962, the project will be evaluated and a decision made on continuing further work in the 650-kv range or possibly raising the voltage to higher levels. The right-of-way already acquired is wide enough to provide transmission towers for a million-volt operation, Abetti pointed out, although the tower structures, conductor spacing, and terminal

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equipment would have to be changed.

The line will be built in sparsely settled country along the Housatonic valley from a point north of Lee to Pittsfield. It will cross the winding Housatonic river several times. Unusually large structures will be needed to carry the line through this varied terrain of pasture, swamp, and rocky woods, at an altitude above sea level of about 1,000 feet.

"Bundled" conductors used

Spans between towers will range from 800 to 2200 feet. Largest towers will have two upright members 160 feet high and a horizontal cross bar 180 feet long. Three "bundled" conductors, one for each phase of a three-phase power circuit, will be hung at the ends of 20-foot long insulator strings suspended from crossbar.

For 650-kv operation the conductors will be spaced up to 50-feet apart to prevent high-voltage electricity from sparking over from one phase to another. The spacing of the conductors will be altered for different voltages, and the number of cables in each "bundle" will vary from two to four according to test requirements.

A bundled conductor is a cluster of two or more power cables held about 18 inches apart by spacers but not electrically isolated from each other.

The towers will be built high enough from the ground so that conductor sag in mid-span is not less than 30 feet above the earth.

Dr. Abetti concluded by saying that today's renewed interest in extra high voltage transmission in America has resulted from the rapid growth and interconnection of power systems, and the need for transmitting more power over restricted rights-of-way. General Electric is proud of its contribution to the technology upon which America's present high-voltage systems are based. Now Project EHV will help fill the need for new and wider technology in extra-high-voltage and will help re-establish the United States as a world leader in the extra-high-voltage field, he said.

Code discussion

(Continued from page 82)

clear space in a boiler room or machine room would be suitable, depending on the ambient temperature and the proximity of the boiler and machinery.

I saw a service panel over a kitchen range so hot that the overcurrent device opened at less than 50% load. The owner was left with the alternatives of doing without electricity, moving the service which was bricked in, or of installing a refrigerating coil around the service equipment. He moved the panel to a cooler spot, but his own temperature increased considerably.

Other areas in the kitchen, however, would be suitable, but not those areas inside cabinets and not those in, under, or too near the sink. Halls would certainly be suitable as well as basements. And I see nothing wrong with garages if in suitable enclosures, well above the 18-inch level, of course, and mounted on walls without shelving or storage cabinets.

Outside on walls is all right in suitable enclosures and also on private poles. Utility company poles are not suitable, as a rule; if used, permission must first be obtained from the utility company.

Keep in mind always that the *nearest* suitable point must be used as far as the inside of the building is concerned. It is not required to put the service switch outside if that is the nearest. But once inside of a building, the service must be installed at the nearest suitable place to the point of entry.

We will endeavor to complete our discussion on services in the next issue.

Answers to Code test questions are as follows: (1) *T* section 2335) (2) *T* section 2336) (3) *F* section 2337) (4) *F* section 2338) (5) *F* section 2339) (6) *C* section 2351-a) (7) *A* section 2351-a) (8) *A* section 2351-b) (9) *B* section 2351-c) (10) *B* section 2351-d).

Record system

(Continued from page 31)

shows all material, labor, and other costs applicable to a job. Using the spirit duplicator, this information is reproduced on the back of the Accounts Receivable Ledger Card (Figure 1).

When the Job Master is completed, all necessary information is available for preparing the customer's invoice. Billing is done immediately on the bookkeeping machine (Figure 3). However, in-

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(July 1958)

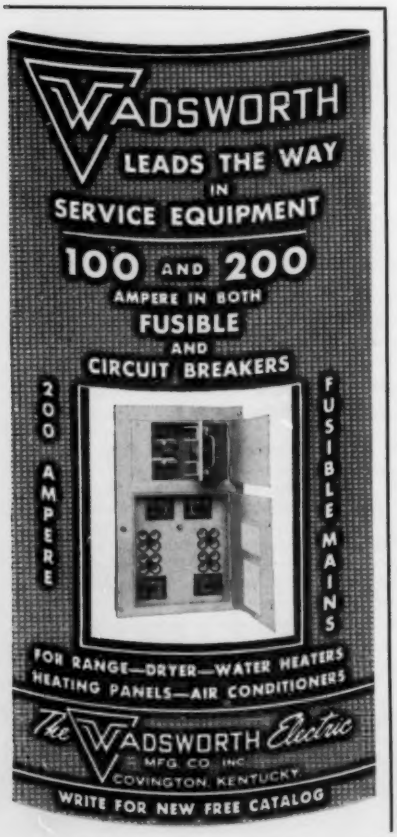
stead of posting directly to the invoice, the machine posting is made on a Billing Master (Figure 2). This is a fast and simple operation: the Billing Master is inserted in the machine and charges for material, labor, tax, and other charges are entered; and the total is cleared.

The Billing Master is then placed in the spirit duplicator to reproduce the necessary copies of the invoice for the customer, for office use, and for the charge entry to accounts receivable.

Both the invoicing and the charge posting to accounts receivable are completed in this simple posting and duplicating operation. The customer's invoice is ready to mail immediately.

Instead of a conventional continuous ledger showing all transactions for each customer, a separate ledger card is created for each job. As shown in Figure 1, job details are reproduced on the back of the card. The front of the same card is the Accounts Receivable Ledger as shown in Figure 4.

A Cash Receipts Journal is produced as a by-product of posting payments to the Accounts Receivable Ledger.



After reproducing the invoice and the necessary copies, the next step is to post Job Cost Analysis. For the owner or manager, this is one of the most important features of the system. It shows immediately whether a profit or loss was made on each job.

The Cost Analysis of each job is made on the Office Copy of the Invoice. This form has a separate block headed "Entry" for this posting. The Sales Summary, which shows the analysis of all jobs and profit or loss resulting from each, is a by-product of this operation.

Immediately upon completion of the Cost Analysis the Office Copies of Invoices for the day should be placed in the hands of the owner or manager. These jobs can be reviewed while they are fresh in the contractor's mind. If a loss has occurred, corrective measures may be taken.

Threading conduit

(Continued from page 34)

package successfully covered 215 feet of 1¼-inch conduit, with a route including a 15-foot vertical climb, three 90° ells, one offset, and a 10-foot down-climb.

With solely a line can, a cartridge—in Test C—covered 120 feet of one-inch conduit, traveling 10 feet vertically, passing three 90° ells, and down eight feet.

Especially recommended for fishing in under floor ducts and similar raceways, the jet gun conveniently eliminates both carrying and maintenance of bulky reels.

Similar methods, to be sure, have likewise been adopted by other electrical contractors to accomplish the same purpose in jet-age time.

Air-propelled ball

Electrical Engineer Robert Haney of Brooks-Allison Company, Atlanta, Ga., recently told ELECTRICAL SOUTH that his company was successfully shooting line through conduit by using rubber balls tied to mason's twine and catapulted by blasts from an air-compressor.

Haney's method requires a small steel plate, into which have been drilled two holes—one for threading mason's twine, the other for attaching the air compresor nozzle. The small plate is placed at the conduit entry. The Mason's twine is threaded through the plate and attached to a firm rubber ball (inside the conduit), a fraction less in diameter than the conduit and flexible enough to by-pass minor conduit obstructions (water, cement dust, etc.). The air compressor, attached to the plate and fired, propels the ball and twine through the necessary conduit.

According to Haney, the firm's initial trial of this method successfully threaded line through a four-inch duct, 540 feet long, and containing two 90° elbows and five 45° bends.

Fault protection

(Continued from page 52)

minimum pick-up is 1.0 ampere with no restraint. When the current in the operating winding exceeds the current by around 15 percent, the contacts close.

In applying the relay, the current transformer ratios are selected such that both windings receive the same secondary current for balanced load and around five amperes for maximum through load.

When the shunt winding is connected in star and grounded, the CA relay current transformers should be connected in delta to avoid operation on external ground faults. An overcurrent relay should be applied in this grounded exciting winding and set selectively so that external ground faults do not operate it before the proper ground relays have had an opportunity to clear the external fault.

If the secondary of the exciting winding is connected in grounded star, an overcurrent relay should be applied in this neutral. If this winding is connected in delta, one leg of the delta may be grounded and an overcurrent relay connected in the grounded circuit. These are illustrated in Fig. 11.

The sudden-pressure relay is recommended for these units particularly, as the potentiality of an arcing fault in the tap-changing equipment is high.

Generator-transformer unit

In the unit-type system, as shown in Fig. 12, the transformer differential relay frequently is connected to include the generator as well as the transformer. This provides additional and overlapping protection of the rotating machine. The generator relay is more sensitive, as previously outlined. Separate current transformers on the generator neutral are recommended to keep the burden low.

The transformer differential relay is not able to provide any ap-

preciable protection for secondary or internal faults in the station service transformer unless they occur near the high voltage end of the primary winding. This is based on the small size of this bank compared to the generator unit. The main units dictate a high ratio of the current transformers to limit secondary currents under continuous operation and high faults. The small size of the station service unit means it has a high impedance and light fault currents frequently below the transformer differential relay sensitivity. A seperate differential relay around the station service bank can be operated with current transformer ratios compatible to the size of this bank. This bank may be protected by overload relays without a separate differential.

Depending upon the relative size of the main and station service units, faults on the low side of the station service unit may be well below the main differential relay sensitivity. In this case, no current transformer connection to the main differential relay circuit is required. Otherwise a connection is required to prevent tripping on station service bus faults. All this assumes that no appreciable current is fed back through the station service unit for faults external to the main unit.

When it is desired to balance out the station service circuit, the current transformers in this circuit may be paralleled as shown.

Recession weathered

(Continued from page 26)

distribution equipment, instruments and controls — and the enormous G-E electrical appliance plant at Louisville. The same is true of many other large national companies.

Another example is the great Ford glass plant at Nashville, Tenn. (yet a small portion of the $400 millions spent by Ford alone in the Southland since World War II.)

Other automotive manufacturing units in being or planned include the 1,300,000-square-foot Chrysler Corp. plant in St. Louis, Mo., recently announced by Executive Vice-President W. C. Newberg.

In discussing selection of St. Louis, Newberg said that the site was "close to the heart of a rapidly expanding automobile market in the South-Central and Southwest areas of the United States."

General Motors Corp. has been active, too, with such projects as the tremendous Buick, Oldsmobile, Pontiac assembly plant close to Atlanta, Ga., and plans to approximately double the Atlanta Chevrolet plant by adding 385,000 square feet of factory space.

However, industry large and small is dependent on power, which today means the production, transmission and distribution of electrical energy. To meet the demands originating in manufacturing plants, homes, stores, warehouses and offices, Southern utilities are expanding at a much faster pace than elsewhere.

In just 10 years following World War II, the seven Southeastern states have advanced from the fourth largest producer of electric energy regionally in the nation to the No. 2 position, according to the U. S. Department of Commerce.

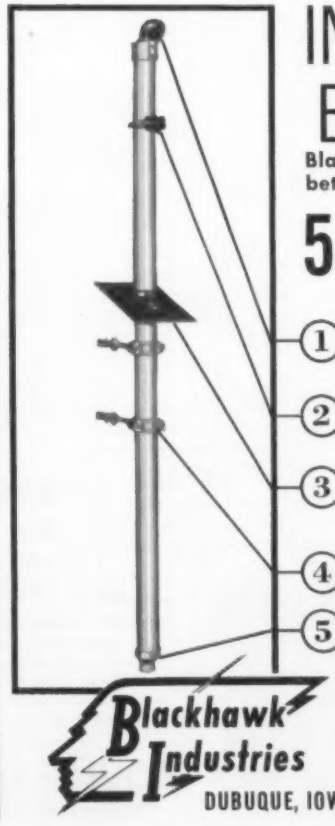
In 1957, 108.4 billion kilowatt hours of electric energy were produced in the seven states by utilities and industries, or more than three times the 31 billion kilowatt hours produced in 1947. Last year's 108.4 billion kw/hr produced in the Southeast was exceeded only by the 162 billion produced in the East North Central states.

The Southeast also led the nation in rate of increase and the West South Central section was second in percentage increase.

Forecasts of nearly all Southern and Southwestern utilities indicate huge construction programs during the coming years. The Southern Co. forecast shows a construction program of $500,000,000 during the years 1958-1960. Since 1927 the rate of growth in the system companies' energy requirements has been slightly over eight percent a year compounded annually—equivalent to a doubling of the load every nine years. Generating units to be installed during the next three years on the Southern Co. system total 1,250,000 kw.

The 1958 program totals $155,000,000 for the Southern system companies: Alabama Power, Georgia Power, Gulf Power, Mississippi Power and Southern Electric Generating Co. This is the largest construction program in the history of the company.

Typical of expansion in the Southwest is a $21,000,000 electric



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power generating expansion program during the next three years for Southwestern Gas & Electric Co. This includes the addition of 100,000 kw units at the company's two plants in Northwest Louisiana.

Probably the most dramatic developments in Southern power generation lie in the field of atomics. With operation scheduled for April 1960, Industrial Testing Reactors, Inc., is constructing a $12 million nuclear reactor in the Wadesboro-Rockingham area of North Carolina. It will employ about 500 and will attract a large complex of industry into the area.

Oak Ridge (Tenn.) National Laboratory now has six nuclear reactors in operation and the Carolinas-Virginia Nuclear Power Association is building a 17,000 kw nuclear plant at Parr Shoals, S. C., near Columbia. Florida developments include a proposed 50,000 kw atomic plant by the East Central-Florida West Coast groups.

These developments have moved so swiftly in the South that some well-informed persons estimate that it will become one of the South's most important industries in the next 10 years.

This is quite a bold prediction but one must respect it when the recent expansion of atomic industries in this part of the country is taken into consideration.

With the upsurge of industry, the growth of trade and the consequent expansion of consumer incomes, there has come a great demand for newer and better housing. To meet this demand residential construction has increased steadily. In 1957 the South was the only region showing an increase in dwelling units started over the preceding year. With a total of 346,300 it exceeded any other region and accounted for 33.23% of the U. S. total. This not only reflects Southern prosperity but by an odd twist also adds to it, by increasing the opportunities for commerce and employment.

While all the other economic gains are being made, the automotive industry is not idle. True, franchised car dealers have been having a rough time of it throughout the nation, but their objective —particularly the younger ones with the years ahead to afford it —are looking to the booming market in the '60s when 1955's record sales year of 9,000,000 cars and trucks will be topped by 10,000,000 or more units.

In 1939, total vehicle sales in the South amounted to 952,893 units and today total registrations are over 23,000,000. In most recent years annual sales in this area have been exceeding 2,000,000.

The true picture of motor vehicle usage is revealed by gasoline consumption figures which show current annual purchases in the South to be almost 21 billion gallons, or nearly 1,000 gallons per vehicle. This is 37.1% of the U. S. total and this proportion is showing steady annual increases.

Away back in 1895, my father, the late W. R. C. Smith, Michigan-born and -reared, visited the Cotton States and International Exposition in Atlanta. He was so impressed with what he termed "the nation's last industrial frontier" that he returned permanently in 1905 to establish our present publishing company.

His dream of the South's future has been fulfilled. True, we still have our moonlight and magnolias —our beautiful Southern ladies— some plantations and an occasional mint julep, but those of us who have our roots in the soil of Dixie, and the many transplanted Southerners like my father, can take pride in the fact that the tenacity and energy which characterized our ancestors is still prevalent in the great and growing South.

Built-in regulator

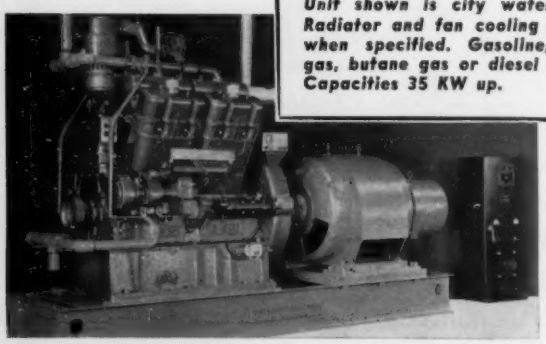
(Continued from page 45)

SRT's was discussed by A. R. Waehner, director of transformer sales for Line Material Industries, who reported that the cost of SRT's would be approximately $50 more than a conventional tapped transformer. "Simply increase the net price of a standard transformer with taps by approximately 6 per cent, then add $50," he said.

"In introducing a new development, such as SRT," Mr. Waehner continued, "we believe that the limited number of units available should be distributed among utilities in all parts of the U. S. Our field engineers will, therefore, invite utilities in their areas to purchase SRT's and place them in service. Our field people will also enlist the help of the purchasers of SRT's in collecting service data.

"By marketing the first SRT's on a nationwide basis, we expect to rapidly compile many years of actual operating experience under a variety of conditions. Information such as type of load, number of consumers served, peak load values, purpose of application, performance, and consumer comments will be requested for each SRT installation. We will also request voltage charts and operations-counter readings.

"As operating experience is accumulated, periodic reports will be made available to the electrical industry."



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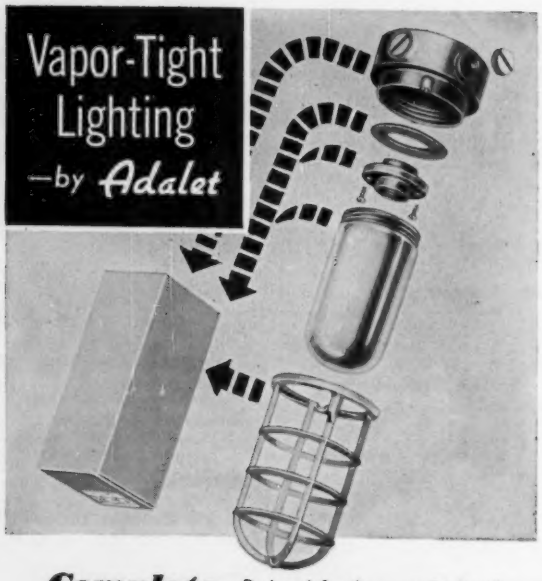

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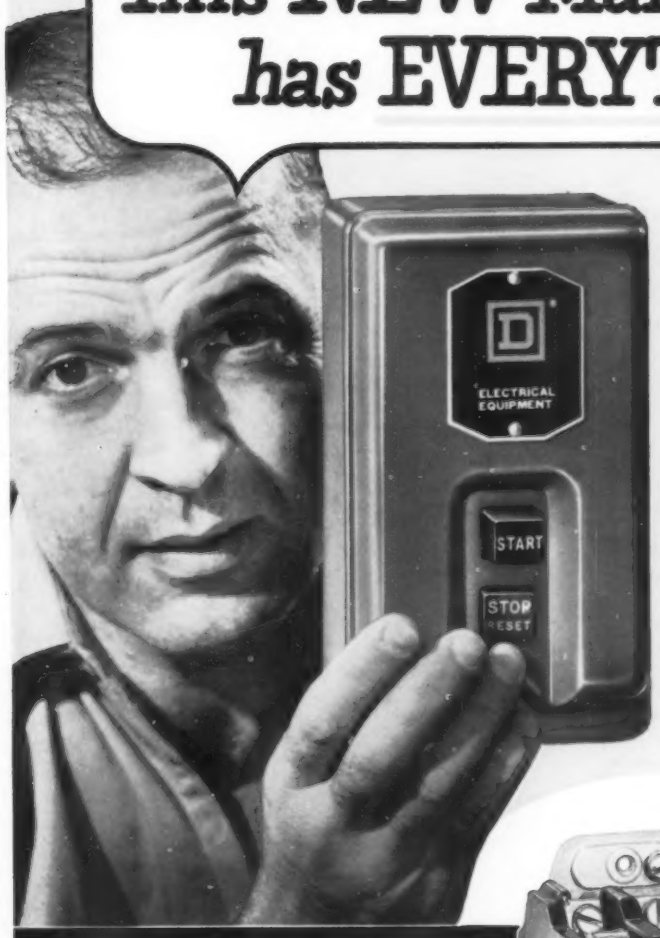

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